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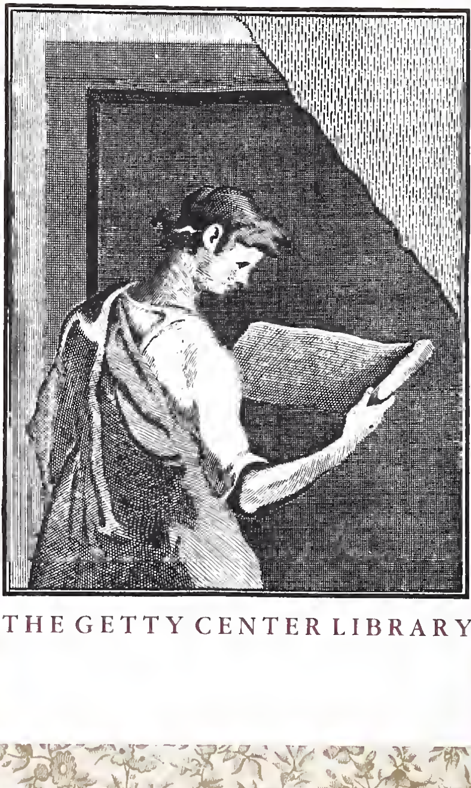

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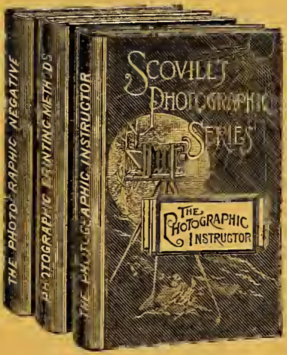
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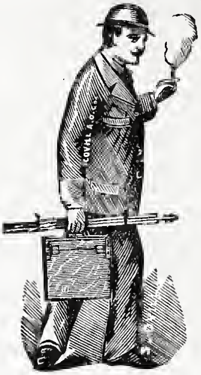

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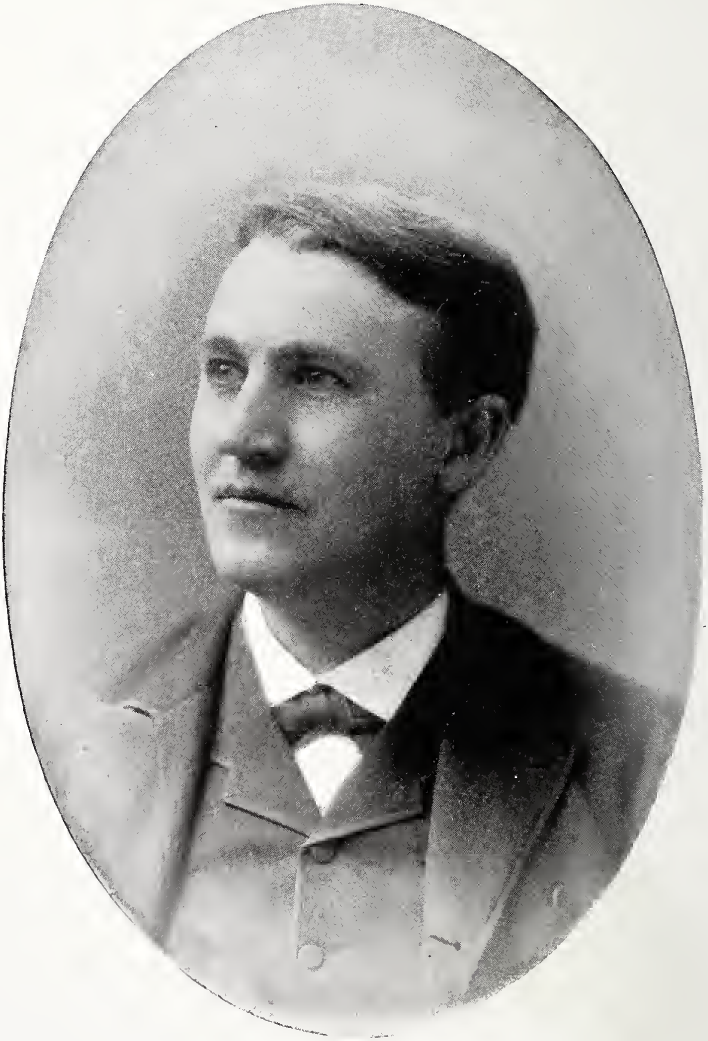

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ALMANAC

FOR 1890

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PREFACE.

It is to be doubted if a "Preface" carries much weight with it; whether many persons read one, if provided, or notice the omission, if dispensed with, especially in a book of this kind, where it rather stands in the way of getting at once to the "milk in the cocoanut"; the practical hints and accumulated experiences of the numerous contributors to this issue of the "ANNUAL."

Nevertheless, as the preceding volumes have had prefaces, the purpose to make this uniform with them will answer as a reason for this one, should no other be evident. And this is certainly a convenient and proper place to formally express the obligations which the editor is under to all those whose work, even more than his own, has made the "ANNUAL" what it is to-day; also to all the contributors of articles and of illustrations.

While the former have given of their time and of their phosphates and other brain salts, the latter have been to money expense in furnishing the various enrichments which beautify the following pages, appealing alike to the eye of the connoisseur in Art, in Photography, or Process work. To be sure, it is supposed that not alone interest in Photographic progress, or goodwill toward the "ANNUAL," but also a keen business in-

stinct, prompts them to take advantage of its large and select circulation and its recognized position among photographic publications; and that they do not fail to reap advantage from the prominence they thus secure; but their kindness merits full acknowledgement, which is hereby rendered.

Finally, to all the readers and friends of the "ANNUAL," greeting and best wishes of

THE EDITOR.

November 1st, 1889.

ADDENDUM.—The illustration, opposite page 80 shows a basket of fruit, grown on W. A. Duncan's plantation, Walker's Station, Georgia, near the Florida line.

The photograph was made on a Carbutt orthochromatic plate without a ray filter, with a Gundlach rapid rectigraph objective by one of the scholars of the practising class of 1889 of the Chautauqua School of Photography. The superiority of color sensitive plates over those coated with a pure bromide of silver gelatine emulsion is shown to perfection in this modest little specimen.

The half tone printing block, reproduced from the original negative plate, was made by the Electro-Light Engraving Co., Mr. Charles A. Breck, proprietor, corner of Ann and William Streets, New York. The fine quality of the work commends itself.

Chicago Camera Club, The.—182 Wabash Avenue, Chicago, Ill. Organized, May, 1889. *President*, Rev. M. L. Williston; first *Vice-President*, Frank Sayre Osborne; second *Vice-President*, Mrs. Horatio N. May; *Directors*, Rev. M. L. Williston, Frank Sayre Osborne, Mrs. H. N. May, Fred. K. Morrill, John W. Buehler, Miss Grace F. Temple, C. D. Irwin, Mrs. D. M. Stevenson, Heaton Owsley, Mrs. P. B. Weare, J. P. Gardner. *Treasurer*, John W. Buehler; *Librarian*, Miss Grace F. Temple. *Secretary*, Fred. K. Morrill, 182 Wabash Avenue, Chicago. Place of meeting, Club Rooms, 182 Wabash Avenue. Ordinary meetings, second Thursday each month. Annual meeting, April. Membership, Jan. 1: honorary, 8; active, 119; associate, 9; total, 138. Club rooms open continuously. Members of other camera clubs always welcome, and the entire facilities of the club at their disposal.

Mystic Camera Club, The.—Medford, Mass. Organized June 4, 1889. Meetings, first Tuesday in each month. Annual meeting, first Tuesday in January. *President*, George E. Davenport; *Vice-President*, A. F. Boardman; *Secretary and Treasurer*, George L. Stone; *Executive Committee*, Messrs. George E. Davenport, A. F. Boardman, George L. Stone, E. H. Balcom, B. D. Bourne, E. Lawrence Jenkins. Secretary's address, George L. Stone, No. 1 Ashland Place, Medford, Mass.

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CENTURY CALENDAR.

For explanation see opposite page.

Table 1. Years 1800-1901.

For economy of space, the century prefixes "18" and "19" have been omitted.

00	01	02	03	**04**	04	05
06	07	**08**	08	09	10	11
12	12	13	14	15	**16**	16
17	18	19	**20**	20	21	22
23	**24**	24	25	26	27	**28**
28	29	30	31	**32**	32	33
34	35	**36**	36	37	38	39
40	40	41	42	43	**44**	44
45	46	47	**48**	48	49	50
51	**52**	52	53	54	55	**56**
56	57	58	59	**60**	60	61
62	63	**64**	64	65	66	67
68	68	69	70	71	**72**	72
73	74	75	**76**	76	77	78
79	**80**	80	81	82	83	**84**
84	85	86	87	**88**	88	89
90	91	**92**	92	93	94	95
96	96	97	98	99	00	01

Table 2. 1st day of Month.

Jan	W	Th	F	S	𝔖	M	Tu
Feb	S	𝔖	M	Tu	W	Th	F
Mar	S	𝔖	M	Tu	W	Th	F
Apl	Tu	W	Th	F	S	𝔖	M
May	Th	F	S	𝔖	M	Tu	W
June	𝔖	M	Tu	W	Th	F	S
July	Tu	W	Th	F	S	𝔖	M
Aug	F	S	𝔖	M	Tu	W	Th
Sep	M	Tu	W	Th	F	S	𝔖
Oct	W	Th	F	S	𝔖	M	Tu
Nov	S	𝔖	M	Tu	W	Th	F
Dec	M	Tu	W	Th	F	S	𝔖

Table 3. Days of Month.

1	𝔖	M	Tu	W	Th	F	S	1
2	M	Tu	W	Th	F	S	𝔖	2
3	Tu	W	Th	F	S	𝔖	M	3
4	W	Th	F	S	𝔖	M	Tu	4
5	Th	F	S	𝔖	M	Tu	W	5
6	F	S	𝔖	M	Tu	W	Th	6
7	S	𝔖	M	Tu	W	Th	F	7
8	𝔖	M	Tu	W	Th	F	S	8
9	M	Tu	W	Th	F	S	𝔖	9
10	Tu	W	Th	F	S	𝔖	M	10
11	W	Th	F	S	𝔖	M	Tu	11
12	Th	F	S	𝔖	M	Tu	W	12
13	F	S	𝔖	M	Tu	W	Th	13
14	S	𝔖	M	Tu	W	Th	F	14
15	𝔖	M	Tu	W	Th	F	S	15
16	M	Tu	W	Th	F	S	𝔖	16
17	Tu	W	Th	F	S	𝔖	M	17
18	W	Th	F	S	𝔖	M	Tu	18
19	Th	F	S	𝔖	M	Tu	W	19
20	F	S	𝔖	M	Tu	W	Th	20
21	S	𝔖	M	Tu	W	Th	F	21
22	𝔖	M	Tu	W	Th	F	S	22
23	M	Tu	W	Th	F	S	𝔖	23
24	Tu	W	Th	F	S	𝔖	M	24
25	W	Th	F	S	𝔖	M	Tu	25
26	Th	F	S	𝔖	M	Tu	W	26
27	F	S	𝔖	M	Tu	W	Th	27
28	S	𝔖	M	Tu	W	Th	F	28
29	𝔖	M	Tu	W	Th	F	S	29
30	M	Tu	W	Th	F	S	𝔖	30
31	Tu	W	Th	F	S	𝔖	M	31

EXPLANATION OF CENTURY CALENDAR.

(See opposite page).

To ascertain the day of the week corresponding to any date from the 1st January, 1800, to the 31st of December, 1901, both inclusive; find the given year in Table 1, and follow downward the vertical column containing it, until reaching, in Table 2, the horizontal line beginning with the given month; at the intersection of the column and line, will be found the day of the week with which the month commences. In Table 3, find the vertical column beginning with that day of the week, and follow it downward until reaching the horizontal line beginning with the given day of the month; at the intersection of the column and line will be found the day of the week corresponding to the given year, month and day.

Note.—Leap-years will be found entered twice in Table 1; first in heavy-faced type; and afterward in ordinary characters. The first entry is to be used when the given date is in January or February of the given year; the second, (ordinary type), when falling in any other month.

Examples.—Given the 29th of February, 1824:—To find the day of the week on which it fell. Under the first entry of 24, in Table 1, and opposite Feb., in Table 2, is found Sunday. Under Sunday in Table 3, and opposite 29, is found Sunday, which is the required day of the week. Given the 22d of December, 1864:—Under the second entry of 64, in Table 1, and opposite Dec., in Table 2, is found Th. In Table 3, under Th., and opposite 22, is found Th., which is the required day of the week. Given the 12th of September, 1855:—Under 55, in Table 1, and opposite Sept., in Table 2, is found S. In Table 3, under S and opposite 12, is found W., which is the required day of the week.

ECLIPSES IN 1890.

Note.—*Local mean time for the latitude of New York City is used in reckoning eclipses, sunset and sunrise. Subtract four minutes to change the reckoning to Eastern standard time of 75th meridian.*

Moons phases are calculated for Eastern standard time. "Morn." is understood to extend from Midnight to noon; "Eve." from noon to midnight.

There will be three eclipses this year, two of the Sun and one of the Moon, and a Lunar Appulse.

I.—*A Lunar Appulse*, June 3. The nearest approach of the Moon to the Earth's shadow will occur at 1h. 53m. morn.; but the uncertainty as to the effect of the Earth's atmosphere renders it doubtful whether the Moon will be seen to enter the Earth's shadow or not.

II.—*An annular eclipse of the Sun*, June 17, invisible in North America, visible throughout Europe.

III.—*A partial eclipse of the Moon*, November 26, invisible in the United States.

IV.—*Central eclipse of the Sun*, December 11, invisible except in the Southern Pacific Ocean.

THE SEASONS.

SPRING begins	March 20, 11 a.m.	AUTUMN begins	September 22, 9 p m.
SUMMER begins	June 21, 7 a.m.	WINTER begins	December 21, 4 p.m.

CHURCH DAYS.

Septuagesima	Feb. 2	Easter Sunday	April 6
Sexagesima	Feb. 9	Rogation Sunday	May 11
Quinquagesima	Feb. 16	Ascension Day	May 15
Ash Wednesday	Feb. 19	Whitsunday	May 25
Quadragesima	Feb. 23	Trinity Sunday	June 1
Palm Sunday	March 30	Corpus Christi	June 5
Good Friday	April 4	Advent Sunday	Nov. 30

CHRONOLOGICAL CYCLES.

Dominical Letter	E
Epact	9
Golden Number (Lunar Cycle)	10
Solar Cycle	23
Roman Indiction	3

CHRONOLOGICAL ERAS.

The year 1890, which comprises the latter part of the 114th and the beginning of the 115th year of the Independence of the United States of America, corresponds to the year 6,603 of the Julian Period; the years 7,398-99 of the Byzantine Era; the years 5,650-51 of the Jewish Era; the year 2,643 since the Foundation of Rome according to Varro; the year 2,666 of the Olympiads; the year 1,606 of the era of Diocletian; the year 2,550 of the Japanese Era. The year 1,308 of the Mohammedan Era begins on the 17th day of August, 1890.

January 1, 1890, is the 2,411,369th day since the commencement of the Julian Period.

REFERENCE CALENDAR FOR THREE YEARS.

1889

	S	M	T	W	T	F	S		S	M	T	W	T	F	S		S	M	T	W	T	F	S
Jan.	..	..	1	2	3	4	5	May	..	..	..	1	2	3	4	Sept.	1	2	3	4	5	6	7
	6	7	8	9	10	11	12		5	6	7	8	9	10	11		8	9	10	11	12	13	14
	13	14	15	16	17	18	19		12	13	14	15	16	17	18		15	16	17	18	19	20	21
	20	21	22	23	24	25	26		19	20	21	22	23	24	25		22	23	24	25	26	27	28
	27	28	29	30	31	..	..		26	27	28	29	30	31	..		29	30	..	..	..	..	..
Feb.	..	..	..	..	..	1	2	June	..	..	..	..	..	..	1		..	..	1	2	3	4	5
	3	4	5	6	7	8	9		2	3	4	5	6	7	8	Oct.	6	7	8	9	10	11	12
	10	11	12	13	14	15	16		9	10	11	12	13	14	15		13	14	15	16	17	18	19
	17	18	19	20	21	22	23		16	17	18	19	20	21	22		20	21	22	23	24	25	26
	24	25	26	27	28	..	..		23	24	25	26	27	28	29		27	28	29	30	31	..	..
Mar.	..	..	..	..	..	1	2		30	..	..	..	..	..	..		..	..	..	..	..	1	2
	3	4	5	6	7	8	9	July	..	1	2	3	4	5	6	Nov.	3	4	5	6	7	8	9
	10	11	12	13	14	15	16		7	8	9	10	11	12	13		10	11	12	13	14	15	16
	17	18	19	20	21	22	23		14	15	16	17	18	19	20		17	18	19	20	21	22	23
	24	25	26	27	28	29	30		21	22	23	24	25	26	27		24	25	26	27	28	29	30
	31	..	..	..	..	..	..		28	29	30	31	..	..	..		..	..	..	..	..	..	..
April	..	1	2	3	4	5	6	Aug.	..	..	..	..	1	2	3	Dec.	1	2	3	4	5	6	7
	7	8	9	10	11	12	13		4	5	6	7	8	9	10		8	9	10	11	12	13	14
	14	15	16	17	18	19	20		11	12	13	14	15	16	17		15	16	17	18	19	20	21
	21	22	23	24	25	26	27		18	19	20	21	22	23	24		22	23	24	25	26	27	28
	28	29	30	..	..	..	..		25	26	27	28	29	30	31		29	30	31	..	..	..	..

1890

	S	M	T	W	T	F	S		S	M	T	W	T	F	S		S	M	T	W	T	F	S
Jan.	..	..	..	1	2	3	4	May	..	..	..	..	1	2	3	Sept.	..	1	2	3	4	5	6
	5	6	7	8	9	10	11		4	5	6	7	8	9	10		7	8	9	10	11	12	13
	12	13	14	15	16	17	18		11	12	13	14	15	16	17		14	15	16	17	18	19	20
	19	20	21	22	23	24	25		18	19	20	21	22	23	24		21	22	23	24	25	26	27
	26	27	28	29	30	31	..		25	26	27	28	29	30	31		28	29	30	..	..	..	..
Feb.	..	..	..	..	..	..	1	June	1	2	3	4	5	6	7	Oct.	..	..	..	1	2	3	4
	2	3	4	5	6	7	8		8	9	10	11	12	13	14		5	6	7	8	9	10	11
	9	10	11	12	13	14	15		15	16	17	18	19	20	21		12	13	14	15	16	17	18
	16	17	18	19	20	21	22		22	23	24	25	26	27	28		19	20	21	22	23	24	25
	23	24	25	26	27	28	..		29	30	..	..	..	..	..		26	27	28	29	30	31	.
Mar.	..	..	..	..	..	..	1	July	..	..	1	2	3	4	5	Nov.	..	..	..	..	..	..	1
	2	3	4	5	6	7	8		6	7	8	9	10	11	12		2	3	4	5	6	7	8
	9	10	11	12	13	14	15		13	14	15	16	17	18	19		9	10	11	12	13	14	15
	16	17	18	19	20	21	22		20	21	22	23	24	25	26		16	17	18	19	20	21	22
	23	24	25	26	27	28	29		27	28	29	30	31	..	..		23	24	25	26	27	28	29
	30	31	..	..	..	..	..	Aug.	..	..	..	..	..	1	2		30	..	..	..	..	..	..
April	..	..	1	2	3	4	5		3	4	5	6	7	8	9	Dec.	..	1	2	3	4	5	6
	6	7	8	9	10	11	12		10	11	12	13	14	15	16		7	8	9	10	11	12	13
	13	14	15	16	17	18	19		17	18	19	20	21	22	23		14	15	16	17	18	19	20
	20	21	22	23	24	25	26		24	25	26	27	28	29	30		21	22	23	24	25	26	27
	27	28	29	30	..	..	..		31	..	..	..	..	..	..		28	29	30	31	..	..	..

1891

	S	M	T	W	T	F	S		S	M	T	W	T	F	S		S	M	T	W	T	F	S
Jan.	..	..	..	..	1	2	3	May	..	..	..	..	..	1	2	Sept.	..	..	1	2	3	4	5
	4	5	6	7	8	9	10		3	4	5	6	7	8	9		6	7	8	9	10	11	12
	11	12	13	14	15	16	17		10	11	12	13	14	15	16		13	14	15	16	17	18	19
	18	19	20	21	22	23	24		17	18	19	20	21	22	23		20	21	22	23	24	25	26
	25	26	27	28	29	30	31		24	25	26	27	28	29	30		27	28	29	30	..	..	..
	..	..	..	..	..	..	..		31	..	..	..	..	..	..	Oct.	..	..	..	..	1	2	3
Feb.	1	2	3	4	5	6	7	June	..	1	2	3	4	5	6		4	5	6	7	8	9	10
	8	9	10	11	12	13	14		7	8	9	10	11	12	13		11	12	13	14	15	16	17
	15	16	17	18	19	20	21		14	15	16	17	18	19	20		18	19	20	21	22	23	24
	22	23	24	25	26	27	28		21	22	23	24	25	26	27		25	26	27	28	29	30	31
	..	..	..	..	..	..	..		28	29	30	..	..	..	..		..	..	..	..	..	..	..
Mar.	1	2	3	4	5	6	7	July	..	..	..	1	2	3	4	Nov.	1	2	3	4	5	6	7
	8	9	10	11	12	13	14		5	6	7	8	9	10	11		8	9	10	11	12	13	14
	15	16	17	18	19	20	21		12	13	14	15	16	17	18		15	16	17	18	19	20	21
	22	23	24	25	26	27	28		19	20	21	22	23	24	25		22	23	24	25	26	27	28
	29	30	31	..	..	..	..		26	27	28	29	30	31	..		29	30	..	..	..	..	..
April	..	..	..	1	2	3	4	Aug.	..	..	..	..	..	..	1	Dec.	..	..	1	2	3	4	5
	5	6	7	8	9	10	11		2	3	4	5	6	7	8		6	7	8	9	10	11	12
	12	13	14	15	16	17	18		9	10	11	12	13	14	15		13	14	15	16	17	18	19
	19	20	21	22	23	24	25		16	17	18	19	20	21	22		20	21	22	23	24	25	26
	26	27	28	29	30	..	..		23	24	25	26	27	28	29		27	28	29	30	31	..	..
	..	..	..	..	..	..	..		30	31	..	..	..	..	..		..	..	..	..	..	..	..

JANUARY, 1890.

1st MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
1	**1**	W	7 25	4 43
2	**2**	Th	7 25	4 44
3	**3**	F	7 25	4 45
4	**4**	Sa	7 25	4 46
5	**5**	𝔖	7 25	4 47
6	**6**	M	7 25	4 48
7	**7**	Tu	7 25	4 49
8	**8**	W	7 24	4 50
9	**9**	Th	7 24	4 51
10	**10**	F	7 24	4 52
11	**11**	Sa	7 24	4 53
12	**12**	𝔖	7 23	4 54
13	**13**	M	7 23	4 55
14	**14**	Tu	7 23	4 56
15	**15**	W	7 22	4 57
16	**16**	Th	7 22	4 59
17	**17**	F	7 21	5 00
18	**18**	Sa	7 21	5 01
19	**19**	𝔖	7 21	5 02
20	**20**	M	7 20	5 03
21	**21**	Tu	7 19	5 04
22	**22**	W	7 18	5 05
23	**23**	Th	7 17	5 07
24	**24**	F	7 17	5 08
25	**25**	Sa	7 16	5 09
26	**26**	𝔖	7 16	5 10
27	**27**	M	7 15	5 11
28	**28**	Tu	7 14	5 13
29	**29**	W	7 13	5 14
30	**30**	Th	7 12	5 15
31	**31**	F	7 12	5 16

Moon's Phases.

Full M., Jan. 6, 0 h. 37 m., morn.
Last Q., Jan. 14, 1 h. 33 m., morn.
New M., Jan. 20, 6 h. 49 m., eve.
First Q., Jan. 27, 3 h. 16 m., eve.

FEBRUARY, 1890.

2d MONTH. 28 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
32	**1**	S	7 11	5 18
33	**2**	𝔖	7 10	5 19
34	**3**	M	7 09	5 20
35	**4**	Tu	7 07	5 21
36	**5**	W	7 06	5 22
37	**6**	Th	7 05	5 23
38	**7**	F	7 04	5 25
39	**8**	S	7 03	5 26
40	**9**	𝔖	7 02	5 27
41	**10**	M	7 01	5 28
42	**11**	Tu	7 00	5 30
43	**12**	W	6 58	5 31
44	**13**	Th	6 57	5 32
45	**14**	F	6 56	5 34
46	**15**	S	6 55	5 35
47	**16**	𝔖	6 53	5 36
48	**17**	M	6 52	5 37
49	**18**	Tu	6 51	5 39
50	**19**	W	6 49	5 40
51	**20**	Th	6 48	5 41
52	**21**	F	6 46	5 43
53	**22**	S	6 45	5 44
54	**23**	𝔖	6 44	5 45
55	**24**	M	6 42	5 46
56	**25**	Tu	6 41	5 48
57	**26**	W	6 39	5 49
58	**27**	Th	6 38	5 50
59	**28**	F	6 37	5 51

Moon's Phases.

Full M., Feb. 4, 8 h. 13 m., eve.
Last Q., Feb. 12, 1 h. 51 m., eve.
New M., Feb. 19, 5 h. 28 m., morn.
First Q., Feb. 26, 9 h. 6 m., morn.

MARCH, 1890.

3d MONTH. **31 DAYS.**

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
60	**1**	Sa	6 35	5 53
61	**2**	𝔖	6 34	5 53
62	**3**	M	6 32	5 54
63	**4**	Tu	6 30	5 55
64	**5**	W	6 29	5 56
65	**6**	Th	6 27	5 57
66	**7**	F	6 25	5 58
67	**8**	Sa	6 24	5 59
68	**9**	𝔖	6 22	6 00
69	**10**	M	6 20	6 01
70	**11**	Tu	6 19	6 02
71	**12**	W	6 17	6 03
72	**13**	Th	6 16	6 04
73	**14**	F	6 14	6 05
74	**15**	Sa	6 12	6 06
75	**16**	𝔖	6 11	6 08
76	**17**	M	6 09	6 09
77	**18**	Tu	6 07	6 10
78	**19**	W	6 06	6 11
79	**20**	Th	6 04	6 12
80	**21**	F	6 02	6 13
81	**22**	Sa	6 01	6 14
82	**23**	𝔖	5 59	6 15
83	**24**	M	5 58	6 16
84	**25**	Tu	5 56	6 17
85	**26**	W	5 54	6 18
86	**27**	Th	5 52	6 19
87	**28**	F	5 51	6 20
88	**29**	Sa	5 49	6 21
89	**30**	𝔖	5 47	6 22
90	**31**	M	5 45	6 23

Moon's Phases.

Full M., March 6, 1 h. 47 m., eve.
Last Q., March 13, 11 h. 5 m., eve.
New M., March 20, 4 h. 1 m., eve.
First Q., March 28, 4 h. 33 m., morn.

APRIL, 1890.

4th MONTH. **30 DAYS.**

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
91	**1**	Tu	5 44	6 24
92	**2**	W	5 42	6 26
93	**3**	Th	5 41	6 27
94	**4**	F	5 39	6 28
95	**5**	Sa	5 37	6 29
96	**6**	S	5 36	6 30
97	**7**	M	5 34	6 31
98	**8**	Tu	5 33	6 32
99	**9**	W	5 31	6 33
100	**10**	Th	5 30	6 34
101	**11**	F	5 28	6 35
102	**12**	Sa	5 26	6 36
103	**13**	𝔖	5 25	6 37
104	**14**	M	5 24	6 38
105	**15**	Tu	5 22	6 39
106	**16**	W	5 20	6 40
107	**17**	Th	5 19	6 41
108	**18**	F	5 17	6 42
109	**19**	Sa	5 16	6 43
110	**20**	𝔖	5 11	6 44
111	**21**	M	5 13	6 45
112	**22**	Tu	5 11	6 46
113	**23**	W	5 11	6 47
114	**24**	Th	5 08	6 48
115	**25**	F	5 07	6 49
116	**26**	Sa	5 06	6 50
117	**27**	𝔖	5 04	6 51
118	**28**	M	5 03	6 52
119	**29**	Tu	5 02	6 53
120	**30**	W	5 00	6 55

Moon's Phases.

Full M., April 5, 4 h. 25 m., morn.
Last Q., April 12, 5 h. 53 m., morn.
New M., April 19, 3 h. 6 m., morn.
First Q., April 26, 11 h. 52 m., eve.

MAY, 1890.

5th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
121	**1**	Th	4 59	6 56
122	**2**	F	4 58	6 57
123	**3**	Sa	4 56	6 58
124	**4**	S	4 55	6 59
125	**5**	M	4 54	7 00
126	**6**	Tu	4 53	7 01
127	**7**	W	4 52	7 02
128	**8**	Th	4 51	7 03
129	**9**	F	4 49	7 04
130	**10**	Sa	4 48	7 05
131	**11**	S	4 47	7 06
132	**12**	M	4 46	7 07
133	**13**	Tu	4 45	7 08
134	**14**	W	4 44	7 09
135	**15**	Th	4 43	7 10
136	**16**	F	4 42	7 11
137	**17**	Sa	4 41	7 12
138	**18**	S	4 40	7 13
139	**19**	M	4 39	7 14
140	**20**	Tu	4 39	7 15
141	**21**	W	4 38	7 16
142	**22**	Th	4 37	7 17
143	**23**	F	4 36	7 18
144	**24**	Sa	4 36	7 19
145	**25**	S	4 35	7 20
146	**26**	M	4 34	7 20
147	**27**	Tu	4 34	7 21
148	**28**	W	4 33	7 22
149	**29**	Th	4 32	7 23
150	**30**	F	4 32	7 23
151	**31**	Sa	4 31	7 24

Moon's Phases.

Full M., May 4, 4 h. 9 m., eve.
Last Q., May 11, 11 h. 22 m., morn.
New M., May 18, 3 h. 18 m., eve.
First Q., May 26, 5 h. 34 m., eve.

JUNE, 1890.

6th MONTH. 30 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M
152	**1**	S	4 31	7 24
153	**2**	M	4 30	7 25
154	**3**	Tu	4 30	7 26
155	**4**	W	4 30	7 26
156	**5**	Th	4 29	7 27
157	**6**	F	4 29	7 28
158	**7**	Sa	4 29	7 28
159	**8**	S	4 29	7 29
160	**9**	M	4 28	7 30
161	**10**	Tu	4 28	7 30
162	**11**	W	4 28	7 31
163	**12**	Th	4 28	7 31
164	**13**	F	4 28	7 32
165	**14**	Sa	4 28	7 32
166	**15**	S	4 28	7 32
167	**16**	M	4 28	7 33
168	**17**	Tu	4 28	7 33
169	**18**	W	4 28	7 33
170	**19**	Th	4 28	7 34
171	**20**	F	4 29	7 34
172	**21**	Sa	4 29	7 34
173	**22**	S	4 29	7 34
174	**23**	M	4 29	7 34
175	**24**	Tu	4 29	7 34
176	**25**	W	4 30	7 35
177	**26**	Th	4 30	7 35
178	**27**	F	4 30	7 35
179	**28**	Sa	4 29	7 35
180	**29**	S	4 29	7 35
181	**30**	M	4 29	7 35

Moon's Phases.

Full M., June 3, 1 h. 34 m., morn.
Last Q., June 9, 4 h. 50 m., eve.
New M., June 17, 4 h. 58 m., morn.
First Q., June 25, 8 h. 54 m., morn.

JULY, 1890.

7th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City.	
			Sun rises.	Sun sets.
			H. M.	H. M.
182	1	Tu	4 32	7 35
183	2	W	4 32	7 35
184	3	Th	4 33	7 34
185	4	F	4 33	7 34
186	5	Sa	4 34	7 34
187	6	S	4 35	7 34
188	7	M	4 35	7 33
189	8	Tu	4 36	7 33
190	9	W	4 37	7 33
191	10	Th	4 37	7 32
192	11	F	4 38	7 32
193	12	Sa	4 39	7 31
194	13	S	4 39	7 31
195	14	M	4 40	7 30
196	15	Tu	4 41	7 30
197	16	W	4 42	7 29
198	17	Th	4 43	7 29
199	18	F	4 44	7 28
200	19	Sa	4 44	7 27
201	20	S	4 45	7 26
202	21	M	4 46	7 26
203	22	Tu	4 47	7 25
204	23	W	4 48	7 24
205	24	Th	4 48	7 23
206	25	F	4 49	7 23
207	26	Sa	4 50	7 22
208	27	S	4 51	7 21
209	28	M	4 52	7 20
210	29	Tu	4 53	7 19
211	30	W	4 54	7 18
212	31	Th	4 55	7 17

Moon's Phases.

Full M., July 2, 9 h. 23 m., morn.
Last Q., July 8, 11 h. 43 m., eve.
New M., July 16, 7 h. 50 m., eve.
First Q.,.July 24, 9 h. 44 m., eve.
Full M., July 31, 4 h. 24 m., eve.

AUGUST, 1890.

8th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City.	
			Sun rises.	Sun sets.
			H. M.	H. M.
213	1	F	4 56	7 16
214	2	Sa	4 57	7 14
215	3	S	4 58	7 13
216	4	M	4 59	7 12
217	5	Tu	5 00	7 11
218	6	W	5 01	7 10
219	7	Th	5 02	7 09
220	8	F	5 03	7 07
221	9	Sa	5 04	7 06
222	10	S	5 05	7 05
223	11	M	5 06	7 04
224	12	Tu	5 07	7 02
225	13	W	5 08	7 01
226	14	Th	5 09	7 00
227	15	F	5 10	6 58
228	16	Sa	5 11	6 57
229	17	S	5 12	6 55
230	18	M	5 13	6 54
231	19	Tu	5 14	6 53
232	20	W	5 15	6 51
233	21	Th	5 16	6 50
234	22	F	5 17	6 48
235	23	Sa	5 17	6 47
236	24	S	5 18	6 45
237	25	M	5 19	6 44
238	26	Tu	5 20	6 42
239	27	W	5 21	6 41
240	28	Th	5 22	6 39
241	29	F	5 23	6 37
242	30	Sa	5 24	6 36
243	31	S	5 25	6 34

Moon's Phases.

Last Q., Aug. 7, 9 h., 19 m., morn.
New M., Aug. 15, 11 h. 20 m., morn.
First Q., Aug. 23, 8 h. 20 m., morn.
Full M., Aug. 29, 11 h. 35 m., eve.

SEPTEMBER, 1890.

9th MONTH. 30 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City.	
			Sun rises.	Sun sets.
			H. M.	H. M.
244	**1**	M	5 26	6 33
245	**2**	Tu	5 27	6 31
246	**3**	W	5 28	6 29
247	**4**	Th	5 29	6 28
248	**5**	F	5 30	6 26
249	**6**	Sa	5 31	6 24
250	**7**	S	5 32	6 23
251	**8**	M	5 33	6 21
252	**9**	Tu	5 34	6 20
253	**10**	W	5 35	6 18
254	**11**	Th	5 36	6 16
255	**12**	F	5 37	6 15
256	**13**	Sa	5 38	6 13
257	**14**	S	5 39	6 11
258	**15**	M	5 40	6 09
259	**16**	Tu	5 41	6 08
260	**17**	W	5 42	6 06
261	**18**	Th	5 43	6 04
262	**19**	F	5 44	6 03
263	**20**	Sa	5 45	6 01
264	**21**	S	5 46	5 59
265	**22**	M	5 47	5 58
266	**23**	Tu	5 48	5 56
267	**24**	W	5 49	5 55
268	**25**	Th	5 50	5 53
269	**26**	F	5 51	5 52
270	**27**	Sa	5 52	5 50
271	**28**	S	5 53	5 48
272	**29**	M	5 54	5 46
273	**30**	Tu	5 54	5 44

Moon's Phases.

Last Q., Sept. 5, 10 h. 29 m., eve.
New M., Sept., 14, 2 h. 53 m., morn.
First Q., Sept. 21, 5 h. 5 m., eve.
Full M., Sept. 28, 8 h. 0 m., morn.

OCTOBER, 1890.

10th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City.	
			Sun rises.	Sun sets.
			H. M.	H. M.
274	**1**	W	5 56	5 43
275	**2**	Th	5 57	5 41
276	**3**	F	5 58	5 39
277	**4**	Sa	5 59	5 38
278	**5**	S	6 00	5 36
279	**6**	M	6 01	5 35
280	**7**	Tu	6 02	5 33
281	**8**	W	6 03	5 31
282	**9**	Th	6 04	5 30
283	**10**	F	6 05	5 28
284	**11**	Sa	6 07	5 27
285	**12**	S	6 08	5 25
286	**13**	M	6 09	5 23
287	**14**	Tu	6 10	5 22
288	**15**	W	6 11	5 20
289	**16**	Th	6 12	5 19
290	**17**	F	6 13	5 17
291	**18**	Sa	6 14	5 16
292	**19**	S	6 15	5 14
293	**20**	M	6 16	5 13
294	**21**	Tu	6 18	5 12
295	**22**	W	6 19	5 10
296	**23**	Th	6 20	5 09
297	**24**	F	6 21	5 07
298	**25**	Sa	6 22	5 06
299	**26**	S	6 23	5 04
300	**27**	M	6 24	5 03
301	**28**	Tu	6 26	5 02
302	**29**	W	6 27	5 01
303	**30**	Th	6 28	4 59
304	**31**	F	6 29	4 58

Moon's Phases.

Last Q., Oct. 5, 3 h. 23 m., eve.
New M., Oct. 13, 6 h. 5 m., eve.
First Q., Oct. 21, 0 h. 36 m., morn.
Full M., Oct. 27, 6 h. 42 m., eve.

NOVEMBER, 1890.

11th MONTH. 30 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City	
			Sun rises.	Sun sets.
			H. M.	H. M.
305	**1**	Sa	6 30	4 57
306	**2**	S	6 31	4 56
307	**3**	M	6 32	4 54
308	**4**	Tu	6 34	4 53
309	**5**	W	6 35	4 52
310	**6**	Th	6 36	4 51
311	**7**	F	6 37	4 50
312	**8**	Sa	6 38	4 49
313	**9**	S	6 40	4 48
314	**10**	M	6 41	4 47
315	**11**	Tu	6 42	4 46
316	**12**	W	6 43	4 45
317	**13**	Th	6 44	4 44
318	**14**	F	6 46	4 43
319	**15**	Sa	6 47	4 42
320	**16**	S	6 48	4 41
321	**17**	M	6 49	4 40
322	**18**	Tu	6 50	4 39
323	**19**	W	6 51	4 39
324	**20**	Th	6 53	4 38
325	**21**	F	6 54	4 38
326	**22**	Sa	6 55	4 37
327	**23**	S	6 56	4 36
328	**24**	M	6 57	4 36
329	**25**	Tu	6 58	4 35
330	**26**	W	6 59	4 35
331	**27**	Th	7 00	4 35
332	**28**	F	7 01	4 34
333	**29**	Sa	7 03	4 34
334	**30**	S	7 04	4 34

Moon's Phases.

Last Q., Nov. 4, 11 h. 13 m., morn.
New M., Nov. 12, 8 h. 38 m., morn.
First Q., Nov. 19, 7 h. 45 m., morn.
Full M., Nov. 26, 8 h. 23 m., morn.

DECEMBER, 1890.

12th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City	
			Sun rises.	Sun sets.
			H. M.	H. M.
335	**1**	M	7 05	4 34
336	**2**	Tu	7 06	4 33
337	**3**	W	7 07	4 33
338	**4**	Th	7 08	4 33
339	**5**	F	7 09	4 32
340	**6**	Sa	7 10	4 32
341	**7**	S	7 11	4 32
342	**8**	M	7 12	4 32
343	**9**	Tu	7 13	4 32
344	**10**	W	7 14	4 32
345	**11**	Th	7 15	4 32
346	**12**	F	7 15	4 32
347	**13**	Sa	7 16	4 33
348	**14**	S	7 16	4 33
349	**15**	M	7 17	4 33
350	**16**	Tu	7 18	4 33
351	**17**	W	7 18	4 33
352	**18**	Th	7 19	4 34
353	**19**	F	7 20	4 34
354	**20**	Sa	7 20	4 35
355	**21**	S	7 21	4 35
356	**22**	M	7 21	4 36
357	**23**	Tu	7 22	4 37
358	**24**	W	7 22	4 37
359	**25**	Th	7 23	4 38
360	**26**	F	7 23	4 39
361	**27**	Sa	7 23	4 39
362	**28**	S	7 23	4 40
363	**29**	M	7 24	4 40
364	**30**	Tu	7 24	4 41
365	**31**	W	7 24	4 42

Moon's Phases.

Last Q., Dec. 4, 8 h. 27 m., morn.
New M., Dec. 11, 10 h. 11 m., eve.
First Q., Dec. 18, 3 h. 36 m., eve.
Full M., Dec. 26, 0 h. 57 m., morn.

WEATHER INDICATIONS.

Sunset Colors.—A gray, lowering sunset, or one where the sky is green or yellowish green, indicates rain. A red sunrise, with clouds lowering later in the morning, also indicates rain.

Halo (Sun Dogs).—By halo we mean the large circles, or parts of circles, about the sun or moon. A halo occurring after fine weather indicates a storm.

Corona.—By this term we mean the small colored circles frequently seen around the sun or moon. A corona growing smaller indicates rain; growing larger, fair weather.

Rainbows.—A morning rainbow is regarded as a sign of rain; an evening rainbow, of fair weather.

Sky Color.—A deep blue color of the sky, even when seen through clouds, indicates fair weather; a growing whiteness, an approaching storm.

Fog.—Fogs indicate settled weather. A morning fog usually breaks away before noon.

Visibility.—Unusual clearness of the atmosphere, unusual brightness or twinkling of the stars indicates rain.

Clouds.—In observing clouds, we observe their kinds, motions, and outlines. The clouds frequently called "mare's tails" we term Cirri. They are marked by their light texture, fibrous and sundered as in the "mare's tail," or interlacing, as in the far-spreading white cloud, which produces the halo. Small, regularly formed groups of these clouds are frequently seen in fair and settled weather. The Cirri are also the clouds on the forepart of the storm. In this case they are usually more abundant, their outline is very ragged, and they gradually blend into a white, far-reaching cloud bank. The cloud well known as "cotton bales," or "thunder heads," we term cumulus. When they appear during the heat of the day and pass away in the evening, continued fair weather may be expected. When they increase with rapidity, sink into the lower part of the atmosphere, and remain as the evening approaches, rain is at hand. If loose patches appear thrown out from their surfaces, showers may be expected. The clouds usually seen after nightfall, lying in one horizontal plane, and not of great extent, are attendant on fine weather. Small, black, inky clouds and dark scud indicate rain.

Frost.—The first frost and last frost are usually preceded by a temperature very much above the mean.

TABLE

SHOWING THE NUMBER OF CLOUDY, CLEAR, AND RAINY DAYS IN EACH MONTH.*

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Clear..................	11.0	9.8	11.0	10.3	9.6	10.0	11.2	10.8	12.7	12.0	10.3	10.0
Cloudy	11.0	9.9	10.8	10.4	11.5	11.0	11.1	10.3	10.4	12.0	11.9	11.7
Rain or Snow..........	9.2	8.2	9.1	9.2	9.8	8.8	8.4	8.1	6.8	6.8	7.8	9.2

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* From the Meteorological Tables in "The Connecticut Almanac," prepared by Prof. A. W. Phillips, of Yale College.

STANDARD TIME.

For the convenience of the traveling public, the railroads of the United States and the Dominion of Canada on the 18th of November, 1883, adopted an arrangement by which 5 time-standards take the place of the 54 previously used in preparing their time-tables.

The standards adopted with names by which they are distinguished, and their distance in longitude and consequent difference in time from Greenwich are shown by the following table.

Name.	Central Meridian		Hours.	
Intercolonial..................	60°	West	4	Slower
Eastern......................	75°		5	
Central......................	90°	from	6	than
Mountain.....................	105°		7	
Pacific...	120°	Greenwich.	8	Greenwich.

There are thus formed five "Time Belts," each comprising the area lying within 7½ degrees on each side of the different meridians, and measuring approximately 700 miles in breadth. In each of these time-belts, the standard time is one hour faster than in the adjoining time-belt on the West, and one hour slower than in that adjoining on the East. The boundary lines between the different time-belts are not strictly geographical, being arranged to correspond with important railroad points, as follows:—

Intercolonial Times is practically disregarded, as the country included lies so far to the eastward.

Eastern Time prevails over the whole section east of a line drawn from Buffalo, N. Y., through Pittsburgh, Pa.; Parkersburgh and Huntington, W. Va.; Bristol, Tenn., and Augusta, Ga., changing at these places (except Grand Trunk, of Canada, which changes at Sarnia) to

Central Time which extends to the irregular line drawn from Brandon, Man., through Mandan, Dak.; North Platte, Neb.; Dodge City, Kan., to El Paso, New Mexico. West of this line,

Mountain Time is in use, and covers the district up to another line, which, starting from Heron, Mont., passes through Ogden, Utah, to Yuma, Ariz.

Pacific Time is used from this line to the Pacific Ocean.

The Standards adopted by the Railroads have also been very generally adopted by the cities and towns throughout the country in place of the local time; from which it may differ by nearly thirty minutes fast or slow, according as the locality is east or west of the standard meridian. The exact *plus* or *minus* correction to be applied in changing from local to standard time or *vice versa* may be easily calculated in the following manner:—Reduce the longitude of the given locality to time (by multiplying the degrees, minutes and seconds by 4, which gives hours, minutes and seconds) and subtract the longitude of the given meridian from it. For example, the longitude of Boston is 71° 4′ = 4h. 44m. Subtracting the longitude of the Eastern Standard Meridian 75° = 5h. from this, gives a *minus* result of 3° 56′ or 15m. 44sec. (say 16m.), as the difference by which Boston local meantime is faster than the Eastern Standard. In a similar manner, the local time of a place 3° 56′ West of the meridian, that is, long. 78° 56′ west, would be 15m. 44 sec. slow.

The following table gives the correction for a number of the principal cities of the continent.

Standard Time Table.

Correction to be applied to local mean time to obtain standard time.

	Standard	Correction		Standard	Correction.		Standard	Correction.
		m.			m.			m.
Eastport, Me. ...	Intercol.	+28	Columbia, S. C...	Eastern.	+24	Memphis, Tenn..	Central.	——
Portland, Me.....	Eastern.	—19	Columbus, O....	Central.	—28	Mobile, Ala......	"	— 8
Montpelier, Vt...	"	—10	Detroit, Mich....	"	—28	New Orleans, La.	"	——
Boston, Mass.....	"	—16	Indianapolis, Ind.	"	—16	Austin, Tex......	"	+31
Springfield, Mass.	"	—10	Chicago, Ill......	"	—10	Cheyenne, Wyo..	Mount'n.	— 1
Providence, R. I.	"	—14	Springfield, Ill...	"	— 2	Denver, Col.	"	——
Hartford, Conn..	"	— 9	Galena. Ill.......	"	+ 2	Santa Fé, N. Mex	"	+ 4
Albany, N. Y....	"	— 5	Milwaukee, Wis.	"	— 8	Helena, Montana	"	—28
New York, N. Y.	"	— 4	St. Paul, Minn...	"	+12	Virginia City, N.	Pacific.	— 2
Utica, N. Y......	"	+ 1	St. Louis, Mo....	"	+ 1	San Francisco, C.	"	+10
Rochester, N. Y.	"	+11	Lawrence, Kan..	"	+21	Portland Ore.....	"	+11
Philadelphia, Pa.	"	+ 1	Omaha, Neb.....	"	+24	Quebec, Quebec.	"	—15
Harrisburg, Pa..	"	+ 7	Bismark, Dakota.	"	+43	Montreal, Quebec	"	— 6
Pittsburg, Pa....	"	+20	Savannah, Ga....	"	—36	Ottawa, Ont.....	"	+ 3
Baltimore, Md...	"	+ 6	Milledgeville. Ga	"	—27	Toronto, Ont...	"	+18
Washington, D.C	"	+ 8	Jacksonville, Fla.	"	—33			
Wheeling, W.Va.	"	+23	Louisville, Ky. ..	"	—18			

DIFFERENCE IN TIME (For Cable Purposes),

Between New York and some of the Principal Commercial Cities of the World. This Table is Approximate; the odd seconds are not given.

	H.M.		H.M.		H.M.		H.M.
Aden	7.56 F	Brussels	5.14 F	Gibraltar	4.35 F	Moscow	7.25 F
Alexandria	6.56 F	Buenos Ayres	1.02 F	Greenwich	4.56 F	Panama	.12 S
Algiers	5.08 F	Cadiz	4.27 F	Hamburg	5.36 F	Paris	5.02 F
Amsterdam	5.16 F	Calcutta	10.50 F	Havana	.33 S	Rio de Janeiro	2.03 F
Antwerp	5.13 F	Canton	11.31 S	Hong Kong	11.27 S	Rome	5.46 F
Athens	6.31 F	Cape Town	6.10 F	Lisbon	4.19 F	St. Petersburg	6.57 F
Bahia	2.34 F	Christiania	5.39 F	Liverpool	4.44 F	Stockholm	6.08 F
Berlin	5.50 F	Constantinople	6.53 F	London	4.56 F	Sidney	9.59 F
Berne	5.26 F	Copenhagen	5.46 F	Madrid	4.42 F	Valparaiso	.10 F
Bombay	9.48 F	Dublin	4.31 F	Melbourne	9.14 F	Vera Cruz	1.29 S
Bordeaux	4.53 F	Edinburgh	4.43 F	Mexico City	1.40 S	Vienna	6.01 F
Bremen	5.31 F	Geneva	5.21 F	Montevideo	1.11 F	Yokohama	10.45 S

F—*Fast of N. Y. Time.* S—*Slow of N. Y. Time.*

The Difference in time is calculated on actual New York Mean Time, 74° of longitude west of Greenwich. For the new Standard Time, 75th Meridian west of Greenwich, for places west of New York, subtract 4 minutes; for places east of New York, add 4 minutes.

LEGAL HOLIDAYS IN THE VARIOUS STATES.

January 1. New Year's Day: In Alabama, Arkansas, California, Colorado, Connecticut, Dakota, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Maryland, Michigan, Missouri, Nevada, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Vermont, West Virginia, Wisconsin, and Wyoming.

January 8. Anniversary of the Battle of New Orleans: In Louisiana.

February 22. Washington's Birthday: In Alabama, California, Colorado Connecticut, Dakota, Georgia, Idaho, Illinois, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Texas, Utah, Virginia, Wisconsin, and Wyoming.

February 18. Mardi Gras: In Louisiana.

March 2. Anniversary of Texan Independence: In Texas.

March 4. Firemen's Anniversary: In New Orleans, La.

April 4, 1890. Good Friday: In Louisiana, Maryland, and Pennsylvania.

April 21. Anniversary of the Battle of San Jacinto: In Texas.

April 26. Memorial Day: In Georgia.

May 30. Decoration Day: In California, Colorado, Connecticut, Dakota, Iowa, Illinois, Kansas, Kentucky, Massachusetts. Michigan, Nevada, New Hampshire, New Jersey, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Utah, Vermont, Wisconsin, and Wyoming.

June 1. Labor Day: In Oregon.

July 4. Independence Day: In all the States except Nebraska.

September 1, 1890. Labor Day: In Colorado, Massachusetts, New Jersey, and New York.

November 4, 1890. General Election Day: In California, Dakota, Kansas, Maryland, Missouri, New Hampshire, New Jersey, New York, Ohio, Oregon, South Carolina, and Wisconsin.

November 27, 1890. Thanksgiving Day: Is observed in all the States, though in Nebraska and some others it is not a statutory holiday.

December 25. Christmas Day. In all the States except Nebraska.

Sundays and Fast Days (whenever appointed) are legal holidays in nearly all the States.

Arbor Day is a legal holiday in Idaho and Kansas, the day being set by the Governor. Arbor Day is also a legal holiday in Rhode Island, but does not affect the payment of notes, etc.

In Minnesota, Washington's Birthday is the only general holiday expressly provided by law. As to the maturity of bills and notes, the following days are by implication holidays: Thanksgiving Day, Good Friday, Christmas, January 1st, and July 4th; as to schools Christmas, January 1st, July 4th, Memorial Day, and Thanksgiving Day.

In Nebraska there are no legal holidays established by statute. The same is the case in New Mexico.

Every Saturday after 12 o'clock noon is a legal holiday in New York.

AMERICAN PHOTOGRAPHIC SOCIETIES.

Agassiz Association, Manhattan Chapter, N. Y. (Photographic Section).—*President*, W. T. Demarest; *Treasurer*, W. S. Miller; *Corresponding Secretary*, Edward B. Miller. Meetings, 103 Lexington Avenue. New York City. Date of meetings, third Friday of each month at 8 P. M.

Albany Camera Club, The—Albany, N. Y. Organized, October 21, 1887. *President*, Dr. Samuel B. Ward; *Executive Committee*, Officers of Club; *Treasurer*, M. H. Rochester; *Secretary*, M. H. Rochester, Albany Camera Club, or care The Embossing Company. Place of meeting, No. 20 North Pearl Street. Ordinary meetings, First Friday in each month. Special meetings, at call of officers. Annual meeting, first Friday in November. Membership, September 1: Active, 28. Total, 28.

Amateur Photographers' Association of Watertown, N.Y., The—Organized latter part of January, 1889. *President*, Mr. A. R. Wilson; *Vice-President*, Mr. T. E. Knowlton; *Executive Committee*—Messrs. Knowlton, Woolley, and Childs; *Treasurer and Librarian Secretary*, Mr. C. G. Lewis; *Secretary*, Geo. J. Woolley, care *Watertown Post*, Watertown, N. Y. Place of meeting, at the store of Mr. Wilson, 13 Washington Street. Ordinary meetings, on the first Tuesday of each month, at 7.30 P.M. Special meetings at any time. Annual meeting, the February meeting. Membership, September 1: Active, 8; elect, 2. Total, 10. Nothing definite as regards exhibitions, though some will probably be held during the winter.

Amateur Photographic Society of Baltimore, Md.—Organized April 3, 1885. *President*, Isaac T. Norris; *Vice-President*, Daniel Miller; *Executive Committee*, Daniel Miller, J. Alex. Godby, Wm. F. Jones, Dr. E. C. Wingo and J. B. McKee; *House Committee*, A. S. Murray, Jas. S. Cummins, Harry D. Williar and I. T. Norris; *Treasurer*, Jno. H. Trimble; *Secretary*, Harry D. Williar, Nos. 9 and 11 East Camden Street, or P. O. Box No. 344. Place of meeting, 106 North Charles Street. Ordinary meetings, every Friday. Special meetings, every third Friday in each month. Annual meeting, third Friday in April. Membership September 1st: Honorary, 4; active, 60; lady associate members, 12; corresponding, 2. Total, 78. Exhibitions, Special Lantern Slide in April or May each year.

American Institute, N. Y. (Photographical Section).—New York City. Organized March 27, 1859. *President*. Henry J. Newton; *Vice-President*, John B. Gardner; *Treasurer*, Edward Schell; *Secretary*, Oscar G. Mason, Photographic Department, Bellevue Hospital, New York City. Place of meeting, Institute Hall, Clinton Buildings. Ordinary meetings at 8 P. M. on the first Tuesday of each month, except July and August.

American Lantern-slide Interchange.—*Manager*, George Bullock; *Assistant Managers*, William H. Rau, Philadelphia; Frederick C. Beach, New York. The members of the Interchange are the Society of Amateur Photographers of New York, represented by F. C. Beach; The Philadelphia Photographic Society, by W. H. Rau; Pittsburgh Amateur Photographer's Society, by W. S. Bell; Cincinnati Camera Club, by George Bullock; Louisville Camera Club, by W. A. Peaslee; Chicago Lantern-slide Club, by W. A. Morse; St. Louis

Camera Club, by H. B. Alexander; New Orleans Camera Club, by H. T. Howard; The New Brunswick (N. J.) Camerads, by Prof. Peter T. Austen. From December 1st to June 20th, of each year, exchanges of lantern slides are made monthly between each Association, and annually with the Camera Club of England.

Atlanta Camera Club.—Atlanta, Ga. Organized, October 1, 1888. *President*, office vacant; *Vice-President*, Chas. H. Baker; *Executive Committee*, Five Members; *Treasurer*, F. O. Stockton; *Secretary*, F. J. Paxon, 66½ Whitehall Street, Atlanta, Ga. Place of meeting, 66½ Whitehall Street, Atlanta, Ga. Ordinary meetings, Second Monday evenings of each month. Annual meeting, Second Monday in October. Membership, September 1: Honorary, 1; active, 21. Total 22. Exhibitions, None us yet. Expect to make exhibit at the Piedmont Exposition held here during October.

Boston Camera Club.—50 Bromfield Street, Boston, Mass. Organized 1882. *President*, Geo. E. Cabot, Brookline, Mass.; *Vice-President*, Francis Blake, Auburndale, Mass.; *Executive Committee*, Geo. E. Cabot, Francis Blake, E. F. Wilder, Wm. G. Reed, Wm. S. Briggs, J. G. Hubbard, R. A. Bullock, H. N. Sweet, F. Alcott Pratt, Chas. E. Davis, Jr.; Chas. H. Currier; *Treasurer*, Wm. Garrison Reed, 25 Kilby Street, Boston; *Librarian*, Wm. S. Briggs, Boston; *Secretary*, Edward F. Wilder, 47 Tremont Street, Boston. Place of meeting, Club Rooms, 50 Bromfield Street. Ordinary meetings, first Mondays in each month, except July, August and September, at 8 P. M Special meetings, third Mondays, and oftener as occasion may demand. Annual meeting, first Monday, January, at 8 P. M. Membership September 1st: Honorary, 1; active, 108; associate, 8. Total, 117. Exhibitions: Triennial, jointly with New York and Philadelphia.

Brooklyn Academy of Photography, The—Rooms in the Hoagland Laboratory, Henry, Cor. Pacific Street. Organized, 1887. *President*, Wallace Goold Levison; *Vice-Presidents*, Frank Le Manna, John Lefferts, Jr., John Merritt, M. D., Edgar J. Taylor, Dr. Jas. L. Cornell; *Councilors*, John Merritt, M.D., Geo. N. Messiter, Chas. H. Carter, Hermance Tremper, Wm. T. Wintringham, Gonzalo Poey; *Treasurer*, Edward H. Quantin; *Librarian*, Alexander Black; *Curator*, Hermance Tremper; *Corresponding Secretary*, Willis Dodge; *Recording Secretary*, George S. Wheeler, 517 Fulton Street. Place of meeting, Hoagland Laboratory, Henry, corner Clinton Street. Ordinary meetings, Second Wednesday in each month, at 8 P. M. Annual meeting, First Wednesday in February, at 8 P. M. Membership, September 1: Active, 63; corresponding, 6. Total, 69.

Brooklyn Academy of Science (Photographic Section).—Organized March 26 1888. *Secretary*, J. W. Holbrook, Jr., 462 Hart Street, Brooklyn, N. Y.

Brooklyn Institute (Photographic Department).—Brooklyn Institue, Washington Street, Brooklyn. *President*, Alexander Black, *Brooklyn Times* Office; *Secretary*, Anna L. Meeker.

Brooklyn Society of Amateur Photographers.—*President*, Allan Ormsby; *Vice-President*, Homer Ladd; *Treasurer*, Charles Blake; *Secretary*, George R. Sheldon, Jr., 57 Clark Street.

Buffalo Camera Club.—Buffalo, N. Y. Organized October 10, 1888. *President*, G. Hunter Bartlett; *Vice-President*, J. N. Adam; *Directors*

—J. N. Adam, Dr. Bernard Bartow, G. Hunter Bartlett, C. W. Hamlin, C. E. Hayes, Thos. Cary Welch, E. L. Burdick, C. Robt. Wilson. *Treasurer*, Chas. E. Hayes; *Recording Secretary*, Edwin L. Burdick; *Corresponding Secretary*, Thos. Cary Welch. Place of meeting, Buffalo Library Building. Ordinary meetings, first Friday of each month. Special meetings subject to call by the President. Annual meeting, second Wednesday in October. Membership, September 1: Active, 42. Total, 42. Lime-light exhibitions of lantern slides usually held once each month.

Cambridge Camera Club.—Cambridgeport, Mass. *President*, J. A. Darling; *Treasurer*, C. W. Wilson; *Secretary*, H. Sumner Yates. Place of meeting, 23 William Street. Meetings, first Tuesday in the month.

Camera Club of Hartford, The—Hartford, Conn. Organized Feb. 18, 1885. *President*, James B. Cone; *Executive Committee*—J. B. Cone, E. M. White, E. H. Crowell, A. H. Pitkin, G. L. Parmele, C. L. Goodwin, and C. R. Mason; *Treasurer*, Elmer M. White; *Librarian*, J. C. Hills; *Secretary*, Edward H. Crowell (Traveler's Insurance Co.), Hartford, Conn. Place of meeting, Room No. 68, Ætna Life Ins. Co. Building. Ordinary meetings, second Monday in the month, at 7.30 P.M. Special meetings whenever called by the President at the written request of five members. Annual meeting, second Monday in February. Membership, September 1: Active, 51. Total, 51. Exhibition in the fall.

Camera Club of Rochester, N. Y., The—Rochester, N. Y. Organized January 3, 1889. *President*, G. Hanmer Croughton; *Vice-President*, Geo. W. Rafter, First; Sam'l H. Lowe, Second; *Executive Committee*, H. W. Mathews, Jas. Streeter, H. E. Townley; *Treasurer*, Jas. Streeter; *Secretary*, Peter Mawdsley, Rochester, N. Y. Place of meeting, 158 East Main Street. Ordinary meetings, every Thursday. Annual meeting, first Thursday in January. Membership September 1st: Active, 60. Total, 60.

Canada, Photographic Association of.—*President*, A. T. Barraud; *Secretary*, E. Poole, St. Catharine's, Ontario. Place of meetings, Toronto, August 20, 21, and 22.

Case School Camera Club.—Cleveland, O. Organized 1888. *President*, Frank E. Hall; *Vice-President*, Lafayette D. Vorce; *Treasurer* and *Secretary*, Frank Morse; *Corresponding Secretary*, Milton B. Punnett, Case School of Applied Science, Cleveland, O. Place of meeting, Case School of Applied Science. Ordinary meetings, 4 to 5 P. M. each alternate Friday, commencing October 11th.

Chautauqua Photographic Exchange Club.—Organized August 23, 1888. *President*, Dr. Charles Ehrmann; *Executive Committee*, President and Secretary; *Treasurer* and *Secretary*, Miss Ella Switzer, Philipsburg, Centre Co., Pa.; *Assistant Secretary*, Mrs. Laura A. Mull. Annual meeting, Chautauqua. Membership, September 1: Active, 24. Total, 24, Exhibitions, Annually at Chautauqua.

Chicago Lantern-Slide Club.—Art Institute. Organized, November, 1886. *President*, Col. A. F. Stevenson; *Executive Committee*, Officers of Club; *Treasurer*, E. J. Wagner; *Secretary*, W. A. Morse, No. 20 Kemper Place, Chicago. Place of meeting, Art Institute. Ordinary meetings, Third Tuesday in each month, at 8 P. M. Annual meeting, December. Membership, September 1: Honorary, 1; active, 75. Total, 76.

Chicago Camera Club, The—(See Addendum, page ii.)

Chicago (Ill.), Photographic Society of—*President*, Judge J. B. Bradwell; *Executive Committee*, F. A. Place, M. J. Steffins, H. D. Garrison, M.D; *Treasurer*, G. A. Douglass; *Secretary*, C. Gentilé, 134 Van Buren Street. Place of meeting, Art Institute. Meeting, first Tuesday of each month.

Cincinnati Camera Club.—Cincinnati, O. Organized January 24, 1884. *President*, George Bullock; *Vice-President*, Wm. Hubbell Fisher; *Board of Managers*—President, Vice-President, Recording Secretary, Corresponding Secretary, Treasurer, and Librarian; *Treasurer*, Aaron Prince; *Librarian*, Arch. I. Carson; *Recording Secretary*, Emery H. Barton; *Corresponding Secretary*, H. Clifford Fithian, N. W. cor. 5th and Walnut, Cincinnati, Ohio. Place of meeting, 108 Broadway. Ordinary meetings, first and third Monday nights in each month. Special meetings, annual outing, May 30th, and fortnightly through summer. Annual meeting, first Monday in April. Membership, Sept. 1: Active, 128; total, 128. Annual exhibition in February.

Cleveland Camera Club.—Cleveland, Ohio. Organized January 25, 1887. *President*, Montague Rogers; *Vice-President*, Frank J. Dorn; *Directors*, Frank F. Ogier, Joseph Di Nunzio; *Treasurer*, Will F. Dorn; *Recording Secretary*, Dr. Rob't Dayton; *Corresponding Secretary*, Alfred C. Ogier, 239 Case Avenue, Cleveland, O. Place of meeting, Room 19, No. 5 Euclid Avenue. Ordinary meetings, first and third Tuesdays of each month. Annual meeting, second Tuesday in January. Membership September 1st: Honorary, 3; active, 40. Total, 43.

Columbia College Amateur Photographic Society.—At Columbia College, New York. Organized 1884. *President*, C. E. Gudewill; *Treasurer*, J. T. Davies, Jr.; *Secretary*, H. R. Taylor, School of Arts, Columbia College. Place of meeting, Columbia College. Meetings, first and third Friday in each month during college term. Membership, September 1: Honorary, 27; active, 24. Total, 51.

Columbian College Camera Club.—Washington, D. C. Organized 1888. *President*, Allan J. Houghton; *Vice-President*, Edwin W. Ashford; *Treasurer*, A. J. Houghton; *Librarian*, W. B. Asmussen; *Secretary*, Chas. P. Spooner. Place of meeting, Columbian College, Washington, D. C. Ordinary meetings, every Wednesday afternoon.

Columbus Camera Club, The—Columbus, Ohio. Organized, October 6, 1884, as Columbus Amateur Photographic Club, Columbus, Ohio. Re-organized February 20, 1888, as Columbus Camera Club. *President*, Rev. Geo. Wm. Lincoln; *Vice-President*, Geo. L. Graham; *Executive Committee*, Geo. Wm. Lincoln, Geo. L. Graham, G. Y. Anderson, J. N. Bradford, W. H. Miller, John Field; *Treasurer*, J. N. Bradford; *Secretary*, G. Y. Anderson, Drawer 64, Columbus, Ohio. Place of Meeting, Room 40, Pioneer Block. Ordinary Meetings, Third Thursday in each month, at 7.30 P.M. Special Meetings, At the written request of two members of the Club. Annual Meeting, Third Thursday in December. Membership, September 1: Honorary, 3; Active, 22; Total, 25.

Cornell Camera Club.—Ithaca, N. Y. *President*, W. E. Reed; *Treasurer*, Geo. A. Bliss; *Secretary*, A. Vickers, Ithaca, N. Y. Place of meetings, Physical Lecture-room, Campus. Meetings, every two weeks; every other meeting a lantern-slide exhibit.

Cranford Camera Club.—Cranford, Union County, N. J. Organized September 13, 1888. *President*, William Chamberlain; *Treasurer*, J. P. M. Joseph; *Librarian*, H. H. Parmentier; *Secretary*, A. H. Plummer, Cranford, Union County, N. J. Place of meeting, Cranford, N. J. Ordinary meetings, first and third Monday evening each month for business; intervening Mondays for experimental work; special meetings whenever ordered. Annual meeting, September 13th. Membership, September 1st: Honorary, 1; active, 11; corresponding, 6. Total, 18. Exhibitions, first exhibition November 14th.

German Photographic Society of New York.—Organized, 1868. *President*, A. Mildenberger; *Vice-President*, H. Früwirth; *Treasurer*, G. E. Pellnitz, *Financial Secretary*, L. Schill; *Corresponding Secretary*, H. G. Borgfeldt, 192 Washington Street, Hoboken, N. J. Place of meeting, 62 East Fourth Street, New York City. Ordinary meetings, second and fourth Wednesday of every month at 8.15 P. M.

Grand Rapids Amateur Photographic Club.—Grand Rapids, Mich. *President*, Dr. J. C. Parker; *Executive Committee*, Dr. J. C. Parker, Ralph Tietsort, J. B. Barlow; *Treasurer*, Ralph Tietsort; *Librarian*, N. Fred Avery; *Secretary*, J. B. Barlow, Grand Rapids, Mich. Place of Meeting, 15 Fountain Street. Ordinary Meetings, first and third Monday's in the month, 7.30 P. M. Annual Meeting, first Monday in May. Membership September 1st: Active, 11. Total, 11.

Hoboken (N. J.) Camera Club.—Organized at the residence of Mr. William Sachs, 432 Garden Street. *President*, W. Allen; *Custodian*, C. Beckers; *Secretary*, F. A. Huench, 76 Bloomfield Street, Hoboken, New Jersey.

Indianapolis Camera Club, The—Indianapolis, Ind. Organized November 18, 1887. *President*, Charles McBride; *Vice-President*, H. C. Chandler; *Executive Committee*, John T. Harris, Rembrandt Steele, Henry Kothe; *Secretary and Treasurer*, Carl H. Lieber, 33 South Meridian Street, Indianapolis. Places of Meeting, various. Ordinary Meetings, first Tuesday of every month, 8 P.M. Annual Meeting, November. Membership September 1st: Associate, 1; Active, 32. Total, 33. Exhibitions, occasional.

Louisville Camera Club.—Polytechnic Building, Fourth Avenue. Organized April 24, 1888. *President*, Charles R. Peaslee; *Vice-President*, Alex. Griswold; *Executive Committee*—C. R. Peaslee, Alex. Griswold, R. L. Stevens; *Treasurer*, R. L. Stevens; *Secretary*, R. L. Stevens, 1100 West Main Street, Louisville, Ky. Place of Meeting, Club Rooms, Polytechnic Building. Ordinary Meetings, second and fourth Tuesday in each month, at 8 o'clock P.M. Annual Meeting, second Tuesday in February each year. Membership, September 1: Active, 18; corresponding. 2; total, 20. Public and private lantern-slide exhibitions during the fall and winter in connection with the American Lantern-Slide Interchange.

Lowell Camera Club.—Lowell, Mass. (formerly Lowell Association of Amateur Photographers). Organized Jan., 1889. *President*, Wm. P. Atwood; *Vice-President*, Charles J. Glidden; *Executive Committee*, Officers of the Club; *Treasurer*, Henry W. Barnes; *Librarian*, George A. Nelson; *Secretary*, George A. Nelson, 81 Appleton Street, Lowell, Mass. Place of meeting, Central Block. Ordinary meetings, first Tuesday each month from November to March inclusive, at 8 P.M. Special meetings subject to call of the President. Annual meeting, November. Membership, September 1: Honorary, 1; active, 50; total, 51. First annual exhibition, November, 1889.

Lynn Camera Club, The—Organized January 3, 1888. *President*, Wm. H. Drew; *Vice-President*, J. E. Randall; *Executive Committee*, W. H. Drew, J. E. Randall, J. W. Gibboney, E. F. Bacheller, E. L. Rogers, T. D. Hoyt, W. H. Russell; *Treasurer*, Edw. F. Bacheller, Club House, 42 Broad Street; *Librarian*, Edward L. Rogers; *Secretary*, J. W. Gibboney, Lynn Camera Club House, 42 Broad Street, Lynn, Mass. Place of Meeting, Club House, 42 Broad Street, Lynn, Mass. Ordinary Meetings, first Tuesday in each month at 8 o'clock. Special Meetings, Tuesdays and Thursdays, also Club nights. Annual Meeting, first Tuesday in January. Membership September 1st: Honorary, 1; Active, 24; Associate, 2. Total, 27. Exhibitions of Lantern Slides whenever possible, of Prints at least once a year.

Millbury Camera Club.—Millbury, Mass. Organized June 18, 1888. *President*, Dr. T. D. Bristol; *Vice-President*, Dr. G. C. Webber; *Executive Committee*—Dr. G. C. Webber, Mr. E. H. Park, Miss Ida M. Manson, Miss E. R. Benson; *Treasurer*, Miss E. R. Benson; *Secretary*, Miss E. R. Benson, Millbury, Mass. Place of meeting, Natural History Rooms. Ordinary meetings, first Monday in September, November, January, March, May, and July, at 7.30 P.M. Annual meeting, first Monday in July. Membership, September 1: Active, 21; corresponding, 1; total, 22. Exhibitions at Farmers' and Mechanics' Fair. This Club was incorporated as a Section of the Natural History Society, April 22, 1889.

Minneapolis Camera Club.—Minneapolis, Minn. Organized, Oct. 1887. *President*, R. D. Cleveland; *Vice-President*, F. E. Reed, *Treasurer*, Channing Whitney; *Librarian*, C. A. Hoffman; *Secretary*; C. A. Hoffman, 20 Fourth Street, South. Place of Meeting, 20 Fourth Street, South. Ordinary Meetings, Every Second Wednesday of each month, at 7.30 P. M. Special Meetings, when called by President or Secretary. Membership, September 1: Active, 112; corresponding, 20; total, 132. Exhibitions, Semi-annually, during winter Lantern Exhibitions, and Lectures on Photo-Manipulation monthly.

Mystic Camera Club.—(See Addendum, page ii.)

Newark Camera Club.—883 Broad Street, Newark, N. J. Organized, April 17, 1888. *President*, Wm. A. Halsey; *Vice-President*, Chas. Leroy; *Treasurer*, J. M. Foote; *Secretary*, C. G. Hind, 209 Washington Avenue, Newark. Place of Meeting, 883 Broad Street. Ordinary Meetings, Second Monday in each month, at 8.30 P. M. Special Meetings, as called. Annual Meeting, Third Wednesday in April. Membership, September 1: Honorary, 2; Active, 59: total, 61.

New Brunswick (N. J.) Camerads.—Organized February, 1889. *President*, Prof. P. T. Austen; *Secretary*, Dr. Harry Tredwell. Meetings, Rutgers College; on call.

New Brunswick Camera Club.—New Brunswick, N. J. Organized October 1, 1888. *President*, Peter T. Austen; *Treasurer*, George K. Parsell; *Secretary*, Dr. Harry Tredwell, New Brunswick, N. J. Place of Meeting, Chemical Lecture Room of Rutger's College. Ordinary Meetings, first Wednesday in each month, at 8 P. M. Special Meetings, at call. Membership, September 1: Total, 30.

New Orleans Camera Club.—No. 3 Carondelet Street. Organized, December 16, 1886. Incorporated, May 3, 1888. *President*, H. T. Howard; *Vice-President*, J. A. Hincks; *Board of Directors*, The

President, Vice-President, Treasurer and Secretary. The above elected officers constitute the Governing Committee. ; *Treasurer,* P. E Carrière ; *Librarian,* P. E. Carrière ; *Secretary,* C. H. Fenner, No. 3 Carondelet Street, New Orleans, La. Place of Meeting, No. 3 Carondelet Street. Ordinary Meetings, every Wednesday. Special Meetings, First Wednesday of each month. Annual Meeting, Third Wednesday of November. Membership, September 1 : Honorary, 12 ; active, 69 ; corresponding, 3 ; total, 84. Exhibitions, Monthly. The important committee is the "Lantern Committee :" Dr. M. R. Mandeville, chairman, P. E. Carrière, Horace Carpenter, A. L. Du Quesnay, P. Raynes.

New York Camera Club.—314 Fifth Avenue. Organized 1888. *President,* W. T. Colbron ; *Secretary, pro tem,* W. W. Niles, Jr. Place of meeting, 314 Fifth Avenue. Ordinary meetings, every Friday evening. Annual meeting, second Wednesday in January. Membership September 1st : Active, 70 ; corresponding, 1. Total, 71.

Old Colony Camera Club.—Rockland, Mass. Organized February, 1889. *President,* W. G. E. Freeman ; *Vice-President,* David Smith ; *Treasurer,* Burton O. Estes ; *Librarian,* Frederick Ames ; *Secretary,* Burton O. Estes, Rockland, Mass., P. O. Box, 141. Place of Meeting, Club Rooms, Liberty Street. Ordinary Meetings, Wednesday evenings at 7.30. Annual Meeting, first Wednesday in January. Membership, September 1 : 10.

Oregon Camera Club.—Portland, Oregon. Organized July 1, 1886. *President,* W. W. Bretherton ; *Vice-President,* M. Goldsmith ; *Treasurer* (acting) and *Secretary,* Edw. Norton, Care Oregon Camera Club, 153½ Third Street, Portland, Ore. Place of Meeting, 153½ Third Street. Ordinary Meetings, third Friday of each month. Special Meetings whenever called. Annual Meeting, third Friday in January. Membership September 1st : Honorary, 5 ; Active, 20. Total, 25. Exhibition of Lantern Slides in October.

Pacific Coast Amateur Photographic Association.—605 Merchant Street, San Francisco, California. Organized Feb. 19, 1883. *President,* E. W. Runyou ; *Vice-President,* E. L. Woods ; *Executive Committee*—Major W. H. Heuer, chairman, Messrs. A. Bull, Jr., and W. H. Lowden ; *Treasurer,* G. Knight White ; *Secretary,* G. Knight White, 89 Flood Building, San Francisco, Cal. Place of meeting, 605 Merchant Street, San Francisco, Cal. Ordinary meetings, first Thursday after the first Monday in each month, at 8 P.M. Special meetings at the call of the President. Annual meeting, the regular meeting in March. Membership, September 1 : Honorary, 4 ; active, 62 ; corresponding, 10 ; life, 3 ; total, 79. Exhibition annually.

Photographers' Association of America.—Chicago, Ill. Organized, 1880. *President,* J. M. Appleton, Cleveland, Ohio. ; *Vice-Presidents,* George H. Hastings, Boston, Mass. ; W. V. Ranger, Rochester, N. Y. ; *Executive Committee,* Officers of Association ; *Treasurer,* G. M. Carlisle, M. D., Providence, R. I. ; *Secretary,* D. R. Coover, Iowa City, Iowa. Last place of Meeting, Boston, Mass. Membership, September 1 : Honorary, 20 ; Total, 1,700. Exhibitions, To be held in Washington, D. C., 1890. Time of Meeting, To be settled by Executive Committee in January.

Photographic Association of Brooklyn.—Organized, March 20, 1888. *President,* E. F. Wagner ; *Vice-President,* Dr. F. A. Schlitz ; *Executive Committee,* Dr. E. Riedel, Dr. Emil Rauth, M. Brendel ;

Treasurer, A. Roussell; *Librarian*, L. Burckhardt; *Secretary*, Chas. M. Heid, 412 Wyckoff Street. Place of Meeting, Arion Hall, Brooklyn. Ordinary Meetings, first and third Wednesday of each month. Annual Meeting, March 20th. Membership, September 1: Active, 32; total 32.

Photographic Section, Cincinnati Society of Natural History. (See Cincinnati Camera Club).

Photographic Society of Philadelphia, The—1,305 Arch Street. Organized, 1862. *President*, Frederic Graff; *Vice-Presidents*, John G. Bullock. Joseph H. Burroughs; *Executive Committee*, Dr. Herbert M. Howe, Dr. Ellerslie Wallace, William A. Dripps; *Treasurer*, Samuel M. Fox; *Secretary*, Robert S. Redfield, 1601 Callowhill Street, Philadelphia. Place of Meeting, 1305 Arch Street. Ordinary Meetings, first Wednesday evening of each month, 8 P.M. Conversational Meetings, third Wednesday evening of each month, 8 P M. Annual Meeting, first Wednesday evening in January. Membership September 1st: Active and Life, 225. Exhibitions, Annual,—in connection with The Society of Amateur Photographers of New York and The Boston Camera Club.

Photographic Society of Waterbury, The—Room 18, Baldwin's Block, Waterbury, Conn. Organized, May 1888. *President*, C. R. Pancoast; *Vice-President*, Edw. H. Everett; *Executive Committee*, Sam'l B. Hill, Chairman; Edw. W. Mooring, Jr., E. E. Dewitt. *Treasurer*, Geo. S. Husker; *Secretary*, A. C. Campbell, No. 26 North Willow Street, Waterbury, Conn. Place of Meeting, Room 18 Baldwin's Block, No. 63 Bank Street. Ordinary Meetings, First and Third Fridays of each month, at 8 P.M. Special Meetings, On call of President. Annual Meeting, First Friday in May. Membership, September 1: Active, 20; Corresponding, 2; Total, 22.

Pittsburgh Amateur Photographers' Society.—59 Fourth Ave., Pittsburgh, Pa. Organized May 11, 1885. *President*, W. S. Bell; *Vice-President*, R. F. Smythe; *Executive Committee*, W. L. Scaife, B. Speer, L. S. Clarke, A. M. Martin, A. R. Neeb; *Treasurer*, A. R. Neeb; *Librarian*, J. H. Hunter; *Corresponding Secretary*, Breeding Speer; *Secretary*, F. R. C. Perrin, P. O. Box 511, Pittsburgh, Pa. Place of Meeting, 59 Fourth Avenue. Ordinary Meetings, second Monday each month at 8 o'clock P. M. Special Meetings, last Monday of each month, September to April, Lantern night. Annual Meeting, second Monday of April. Membership September 1st: Honorary, 1; Active, 84. Total, 85. Exhibitions: Annual, in March or April.

Plainfield (N. J.) Camera Club.—*President*, Oscar S. Teale; *Treasurer*, W. H. Lyon, Jr.; *Secretary*, G. Harry Squires, 108 Broadway. Place of meeting, Club-rooms, 13 Park Avenue. Meetings, first Monday in each month.

Postal Photographic Club.—Organized, Jan. 1, 1889. *President*, Randall Spaulding, Montclair, N. J; *Board of Managers*, President and Secretary; *Treasurer*, Dr. J. Max Mueller, West Chester, Pa.; *Secretary*, Dr. J. Max Mueller, West Chester, Pa. Membership, Active, 22; Corresponding, 1; Total, 23. Exhibitions, One album per month, composed of three prints from each member, entirely his or her own work, accompanied by note-book for criticisms, etc.

Providence Camera Club.—87 Weybosset Street, Providence, R. I. Organized, 1883. Incorporated, 1889. *President*, R. Clinton Fuller; *Vice-President*, L. L. Anderström; *Executive Committee*, R. C. Fuller,

L. L. Anderström, C. R. Ferris, H. J. Reynolds, J. E. Davison, Benjamin Smith; *Treasurer*, J. Eliot Davison; *Librarian*, Arthur B. Ladd; *Secretary*, J. Eliot Davison, 87 Weybosset Street. Place of Meeting, Club Room, 87 Weybosset Street. Ordinary Meetings, First Saturday and Tuesday after the third Saturday each month. Annual Meeting, First meeting in March. Membership, September 1: Honorary, 1; Active, 34; Associate, 1; Total, 36. Exhibitions, One Aunual Exhibition. Occasional Lantern Exhibitions.

Quebec Camera Club.—Quebec, P. Q. Organized Feb. 8, 1887. *President*, J. George Garneau, St. Peter Street, Quebec; *Executive Committee*—Capt. W. E. Imlah, J. B. Amyot, W. E. Russell; *Treasurer*, James Brodie; *Secretary*, Ernest Würtele, 93 St. Peter Street, Quebec. Place of meeting, Captain Imlah's Quarters, Citadel. Annual meeting, second Monday in December. Membership, September 1: Active, 10; total, 10.

Selma (Ala.) Y. M. C. A. Camera Club.—*President*, Chas. E. Bailey; *Treasurer* and *Secretary*, S. Orlando Trippe. Place of meeting, Y. M. C. A. Building, Broad Street. Meetings, first Thursday of each month.

Society of Amateur Photographers of New York.—122 West 36th Street. Organized March 28, 1884. Incorporated June 9, 1885. *President*, C. W. Canfield; *Secretary*, H. T. Duffield. Place of meeting, Society's Rooms, 122 West 36th Street. Ordinary meetings, second Tuesday in each month, except July, August and September. Special meetings, fourth Thursday in each month, except July, August and September. Annual meeting, second Tuesday in April.

Southern Tier Photographic Association.—Organized May 10, 1888. *President*, W. L. Sutton; *Vice-President*, Irving Saunders; *Treasurer*, J. G. Corwin; *Secretary*, A. B. Stebbins, Canisteo, Steuben County, N. Y. Place of meeting, at the galleries of members as decided from time to time. Ordinary meetings, quarterly on the third Thursday of the month. Special meetings at the call of the President. Annual meeting, third Thursday of June. Membership, September 1: Honorary, 4; active, 14; total, 18. Object of society, to promote fraternity, and to advance the standing of professional photographers.

Springfield Camera Club.—Springfield, Mass. Organized Oct. 11, 1886. *President*, Wm. P. Draper; *Executive Committee*—Wm. P. Draper, John Leshure, N. P. A. Carter, H. N. Bowman, H. C. Haile; *Treasurer*, N. P. A. Carter; *Librarian*, H. N. Bowman; *Secretary*, John Leshure, P. O. Box No. 1033, Springfield, Mass. Place of meeting, corner Main and Sanford Streets. Ordinary meetings, third Wednesday in the month, at 7.30 P.M. Special meetings at call of the Executive Committee. Annual meeting, third Wednesday in October. Membership, September 1: Honorary, 1; active, 39; total, 40. Exhibition in the fall. Room Committee consists of the following members: W. P. Draper, chairman, H. H. Hallett, C. W. Shaw.

St. Louis Camera Club.—Organized Oct., 1885. Incorporated May, 1889. *President*, Robt. E. M'Bain; *Vice-President*. Rev. C. M. Charropin, S. J.; *Executive Committee*—Eliot C. Jewett, J. W. Dunn, J. B. Holman, and the President and Vice-President, *ex-officio; Librarian*, Rev. C. M. Charroppin; *Secretary* and *Treasurer*, George B. Compton; *Assistant Secretary*, F. J. Hickman. Place of meeting, Club House on 23d, Locust Street and Jefferson Avenues. Ordinary meetings, first Tuesday in each month, except months of July and August. Special meetings, third Tuesday in each month. Annual meeting, first Tuesday in April. Membership, September 1: Associate, 3; active, 50; total, 53. Club exhibitions, third Tuesday of each month; public, three times each season. The Club House was taken possession of September 1st, has large hall, 50x30 feet, Secretary's office, reception room, large vestibule, and dark-room, etc., in basement. Billiard tables and bowling alley will be added the coming season.

Stevens Photographic Society.—Stevens' Institute of Tech., Hoboken, N. J. Organized, March 5, 1888. *President*, A. R. Whitney, Jr.; *Vice-President*, E. H. Peabody; *Treasurer*, C. E. Pearce: *Secretary*, E. W. Frazar, Care Stevens Institute of Tech. Hoboken, N. J. Place of Meeting, Stevens Institute. Ordinary Meetings, Monthly, date and hour named by President. Special Meetings, Subject to order of President. Annual Meetings, First Thursday in October. Membership, September 1: Active, 18; Corresponding, 2; Total, 20. Publications, Papers and proceedings published in the *Stevens Indicator*. Exhibitions, Semi-annually, Fall and Spring of year. Membership is restricted to professors and students of the Stevens Institute.

Syracuse Camera Club.—Syracuse, N. Y. Organized October 4, 1886. *President*, Arthur P. Yates; *Vice-President*, Amos Padgham; *Executive Committee*, Arthur P. Yates, Amos Padgham, Wallace Dickson, Chas. R. Jones; *Treasurer*, Chas. R. Jones; *Secretary*, Wallace Dickson, Box 173, Syracuse, N. Y. Place of Meeting, 332 South Salina Street, Butler Block. Ordinary Meetings, every Friday evening, 8 o'clock. Annual Meeting, first meeting in January. Membership September 1st: Honorary, 1; Active, 56. Total, 57. Exhibitions: Lantern Slide Exhibition at the Rooms after October 1st twice every month; two public Lantern Slide Exhibitions during the fall and winter.

"Tech" Camera Club, The—Worcester, Mass. Organized, September 28th, 1889. *President*, Arthur P. Smith; *Vice-President*, Louis E. Booth; *Executive Committee*, Arthur P. Smith, H. P. Davis, James P. Anderson, E. W. Lazell, Carrol S. Dunphe; *Treasurer*. M. W. Allen; *Librarian*, W. H. Baird; *Secretary*, H. H. Tracy, Worcester Polytechnic Institute, Worcester, Mass. Place of meeting, Boynton Hall, Worcester Polytechnic Institute. Ordinary meetings, room 3, Boynton Hall, at 7:30 P.M., beginning with the third Saturday of September of each year. Special meetings, per order of Executive Committee. Semi-annual meeting, last Saturday in the school one-half year. Membership, October 1; Honorary, 1; Active, 20. *Exhibitions arranged for by Executive Committee.*

Toronto (Can.) Amateur Photographers' Association.—*President*, G. O. E. Bethune; *Vice-President*, W. B. McMurrick; *Treasurer* and *Secretary*, F. D. Manchee. Place of meeting, College of Physicians and Surgeons. Bay Street, Toronto. Meetings, first Monday of month. Weekly club night, Monday evening.

Washington Camera Club.—Washington, D. C. Organized November, 1883, as the Argents, reorganized March, 1887. Incorporated May, 1888, as the Washington Camera Club. *President*, Robt. J. Fisher; *Vice-President*, Perry B. Pierce; *Board of Trustees*, Robt. J. Fisher, S. H. Griffith, M.D., D. E. McComb, Philip T. Dodge, F. A.

Schneider; *Secretary-Treasurer*, S. H. Griffith, M.D., U. S. N.; *Corresponding Secretary*, J. Albert Cole, Office of Supervising Architect, U. S. Treasury Department, Washington, D. C. Place of Meeting, 1420 Pennsylvania Avenue, N. W. Ordinary Meetings, second and fourth Tuesdays of each month, excepting June to September inclusive, when on second Tuesday, 8 o'clock P. M. Special Meetings, at the request in writing of three members. Annual Meeting, second Tuesday in January. Membership September 1st: Honorary 2; Active, 28; Passive, 6. Total, 36. Regular Exhibitions at the Club Rooms May 1st–15th; December 1st–15th.

Worcester Camera Club.—Natural History Rooms, Foster Street, Worcester, Mass. Organized Oct. 16, 1885. *President*, Dr. E. V. Scribner; *Executive Committee*—President, Secretary, and Treasurer; *Treasurer*, George M. Corbett; *Secretary*, Paul B. Morgan, 28 Catherine Street, Worcester, Mass. Place of meeting, Natural History Rooms. Ordinary meetings, second Thursday in each month. Annual meeting, second Thursday in January. Membership, September 1: Active, 54; total, 54. Exhibitions annually in April or May.

Worcester Lantern Slide Club.—Organized Feb. 19, 1889, with five members. Only permanent officer, G. E. Francis, M.D., *Secretary*. Regular meetings on last Tuesday of each month, at No. 4 Elm Street.

Yonkers Photographic Club, The—Deyo Building, Yonkers, N. Y. Organized February 8, 1889. *President*, G. Livingston Morse; *Executive Committee*—G. Livingston Morse, Robert M. Reevs, F. W. R. Eschmann, R. Eickemeyer, Jr., Salter S. Clark; *Treasurer*, Robt. M. Reevs; *Librarian*, W. Blackburn; *Secretary*, Robt. M. Reevs, Box 720, Yonkers, N. Y. Place of meeting, Deyo Building. Ordinary meetings, first Friday of each month, at 8 P.M. Special meetings on request of five members. Annual meeting, last Friday in April. Membership, September 1: Active, 45; total, 45. Exhibitions of lantern slides, November 8, 1889; photographs, January 13–18, 1890.

Zanesville Camera Club, The—Zanesville, Ohio. Organized, March 15, 1888. *President*, E. W. Harvey; *Vice-President*, E. C. Downard; *Board of Managers*, M. J. Harkins, Edgar M. Hatton, E. C. Downard, B. V. H. Schultz; *Treasurer*, Edgar M. Hatton; *Librarian*, C. A. Flammer; *Secretary*, B. V. H. Schultz, 49 South Fifth Street, Zanesville, Ohio. Place of Meeting, Rooms I, 2, 3 & 4 14½ South Sixth Street. Ordinary Meetings, First Thursday each month, at 8 P.M. Special Meetings, Third Thursday in any month, at 8 P.M. Annual Meetings, Second Thursday in March. Membership, September 1: Honorary, 5; Active, 17; Corresponding, 2; Total, 24, Publications, *Photo. Times*, *Wilson's Photo. Magazine*, *Anthony's Semi-Monthly Bulletin*, *Sun and Shade*. Exhibition, Lantern Slide, December, 1889.

Societies with Changed Names.

The Argents. Now Washington Camera Club.

Columbus Amateur Photographic Club. Now Columbus Camera Club.

International Photographic Exchange. Now American Lantern-slide Exchange.

Photographic Section Cincinnati Society of Natural History. Now Cincinnati Camera Club.

St. Louis Association of Amateur Photographers. Now St. Louis Camera Club.

Defunct Societies.

Brooklyn Camera Club.
Montreal Amateur Photographic Club.
Photographic Association of Syracuse.
The Photographer's Club.—Boston and suburbs.
Philadelphia Amateur Photographic Club.
Texas State Photographic Association.

FOREIGN PHOTOGRAPHIC SOCIETIES.

Great Britain and British Colonies.

Aberdeen and North of Scotland Amateur Photographic Association.—Established 1855. President, John Milne; Vice-President, Robert Houston; Secretary, James Main, 8 Elmfield Avenue, Aberdeen. **Albany Institute Amateur Photographic Society.**—Established 1888. President, G. S. Martin; Hon. Secretary and Treasurer, Alfred B. Gee, 19 Drakefell Road, Nunhead, S. E. **Amateur Photographic Association.**—Established 1861. President, His Royal Highness the Prince of Wales; Vice-Presidents, H. S. H. the Duke of Teck, G. C. B, the Most Noble, the Marquis of Drogheda, Lieut-General the Right Hon. the Lord de Ros, The Right Hon. the Earl of Rosse, F. R. S., James Glaisher, Esq., F.R. S., F. R. A.S.; Hon. Secretary, Arthur James Melhuish, Esq., F.R.A.S., and F.R. Met. Soc. Offices, 12 Old Bond Street, London, W. **Amateur Association of Victoria, Melbourne.**—President, E. C. Bell; Vice-Presidents, F. A. Kernot and John Lang; Hon. Treasurer, J. J. Fenton; Hon. Secretary, J. H. Harvey, Victoria Parade, East Melbourne, Victoria. **Amateur Photographic Society.**—Established 1852. President, T. M. Brownrigg; Treasurer and Secretary, W. Wainwright, Hoe Place, Woking. **Amateur Photographic Society of Madras.**—Patrons, Lord Connemara and Lieut-General Sir C. G. Arbuthnot, K.C.B., R.A. Commander-in-Chief, Madras. President, F. B. Hanna, M.A., M.I.C.E.; Vice-Presidents, J. C. Hannyngton, C. S., and C. Michie-Smith, B. Sc.; Secretary and Treasurer, F. Dunsterville, Rayapuram, Madras. **Auckland Photographic Society.**—Meetings on second Thursday in each month. Secretary, A. G. Tibbutt, Auckland, New Zealand. **Bath Photographic Society.**—Established 1888. President, W. Pumphrey; Vice-President Austin J. King; Hon. Secretary and Treasurer, W. Middleton Ashman, 34 Gay Street, Bath. **Batley and District Photographic Society.**—President, Henry Spedding; Hon. Secretary, Herbert Marnith, Batley. **Birkenhead Photographic Association.**—Established 1884. President, Paul Lange. Vice-President, P. H. Phillips; Secretary, John L. Mackrell, 26 Lorne Street, Fairfield, Liverpool. **Birmingham Photographic Society.**—Established 1885. President, R. H. Norris, M.D.; Vice-Presidents, W. Jerome Harrison, F.G.S., B. Karleese, E. H. Jaques; Secretaries, J. H. Pichard, 361 Moseley Road, and William Rooke, Ascot Road, Moseley. **Blackburn Literary Club (Photographic Section).**—Established 1884. President, T. J. Syckelmoore, B.A.; Vice-President, Charles Smithies; Hon. Secretary, E. S. Johnson, Literary Club, Blackburn. **Bolton Photographic Society.**—Established 1879. President, J. R. Bridson; Vice-Presidents, E. N. Ashworth, R. Harwood, W. Banks, Walter Knowles, Rev. J. W. Cundy, Thomas Parkinson; Hon. Secretary, B. H. Abbatt, 12 Corporation Street, Bolton.

Bolton Photographic Club.—Established 1883. President, Jabez Boothroyd; Vice-President, Thomas Jukes; Secretary, James Slater, Town Hall Square, Bolton. **Bradford Photographic Society.**—Established 1882. President, Duncan G. Law; Vice-Presidents, H. Forsyth and W. H. Scott; Treasurer and Secretary, William S. Smith, 55 North Parade, Bradford. **Brampton Photographic Society.**—President, Wm. Carlisle; Hon. Secretary, H. Y. Thompson. **Brechin Photographic Association.**—Established 1888. President, William Shaw Adamson, Causton Castle; Vice-Presidents, Dr. Anderson and R. Adamson Scott, M.A.; Secretary and Treasurer; James D. Ross, 13 Park Road. Brechin, N. B. **Brighton Photographic Society.**—Established 1889. President, W. A. Reau, M.R.C.S.; Vice-President, W. Jago, F.C.S., F.I.C.; Secretary, A. H. C. Corder, 42 Montpelier Road, Brighton. **British Association for the Advancement of Science.**—Established 1831. President, Sir F. J. Bramwell, F.R.S., President-Elect, Professor W. H. Flower, C.B., F.R.S.; Secretary, A. T. Atchison, 22 Albemarle Street, London, W. **Bristol Camera Society.**—Established 1887. President, Harvey Barton; Vice-Presidents, Arthur Richardson, Ph.D., J. M. Munro; Honorary Secretaries, F. Holmes, T. Routledge. Communications should be addressed to the Honorable Secretaries, Bristol Camera Society, University College, Tyndall's Park, Bristol. **Bristol and West of England Amateur Photographic Association.**—Established 1871. President, H. A. H. Daniel; Vice-Presidents, Colonel Playfair and E. Brightman; Treasurer and Secretary, T. B. Bond, Fern Hollow, Stoke Bishop, Queen's Hotel. **Brockley and St. John's Scientific Society.**—President, A. E. Lamb; Vice-Presidents, W. J. Spratling, B.Sc., F.G.S., etc., F. J. Taylor, B.A., M.B.; Jenner Weir, F.L.S., F.Z.S.; Secretary, Lewis M. Biden, 11 Leadenhall Street, London, E.C. **Burnley Photographic Society**—Established 1885. President, J. Butterworth, J. P.; Vice-Presidents, D. Drew, J. C. Brumwell, M.D., J.P.; Hon. Secretary, W. Sutcliffe, 7 Bank Hall Terrace, Burnley. **Bury Photographic and Arts Club.**—Established 1882. President, F. Cooper; Vice-Presidents, E. W. Mellor and W. S. Barlow; Secretary, F. W. Livsey, 110 Victoria Terrace, Walmersley Road, Bury. **Cambridge University Photographic Society.**—Established 1882. President, W. N. Shaw; Vice-President, Rev. A. Chapman; Treasurer and Secretary, W. Harold Tingly, Trinity Hall, Cambridge. **Camera Club.**—Established 1885. 21 Bedford Street, W. C. President, Captain W. de W. Abney, R.E., C.B., F.R.S.; Secretaries, George Davison and Ernest George Spiers, 21 Bedford Street, Covent Garden, W.C. **Cardiff Amateur Photographic Society.**—Established 1885. President, T. Mansel Franklin; Vice-Presidents, Jonas Watson, J.P., Walter Insole, S. W. Allen, M.I.M.E., Alex. Kellar; Hon. Secretary, G. H. Bedford, 127 Bute Road. **Carlisle and County Amateur Photographic Society.**—Established 1885. President, the Mayor of Carlisle; Vice-President, C. S. Hall, M.R.C.S., F.M.S.; Hon. Secretary, H. Y. Thompson; L.S.A., Brampton, Carlisle; Hon. Assistant Secretary, John S. Atkinson, 33 Princess Street, Carlisle. **Cheltenham Photographic Society.**—Established 1865. President, C. E. F. Nash, M. A.; Secretary, W. C. Beetham, 22 Promenade Villas. **Chester Society of Natural Science (Photographic Section).**—Established 1887. Chairman, E. W. Parnell, F.C.S.; Treasurer and Secretary, George Frater, 3 Lorne Street, Chester. **Cornish Camera Club.**—Established 1888. President, G. Lacy; Vice-President, B. Vivian, M.R.C.S.; Honorary Secretary, A. K. Barnett, F.G.S., 11 Penrose Terrace, Penzance. **Coventry and Midland Photographic Society.**—Established 1883. President, Councillor Wm. Andrews; Vice-Presidents,

C. Ambrose, C. H. Waters, H. Sturmey, G. Winstanley; Honorary Secretary, Fred. W. Dew, the City Studio, Norton Street, Coventry, Warwickshire. **Coventry District Cyclists' Society (Photographic Section).**—President, F. W. Dew; Honorary Secretary, F. J. Harker, 40 Smithford Street, Coventry. **Crewe Amateur Photographic Society.**—President, Rev. G. W. Rainsford, M.A.; Vice-Presidents, Col. Cotton, Major Gosset, W. W. G. Webb, Esq.; Honorary Secretary, W. A. Whiston, 13 Union Street. **Croydon Microscopical and Natural History Club (Photographic Section).**—President, Henry G. Thompson, M.D; Honorary Secretary, Charles Hussey, Braeside, Epsom Road, Croydon. **Darlington Photographic Society.**—Established 1888. President, G. Newby Watson; Vice-President, J. A. Fothergill, M.R.C.S.; Honorary Secretary, W. Garritte Brewis, Blytheville, Darlington. **Dartmouth Amateur Photographic Society.**—President, Roger Mostyn; Honorary Secretary and Treasurer, George Barston. **Derby Photographic Society.**—Established 1884. President, Captain W. de W. Abney, R.E., C.B., F.R.S.; Vice-Presidents, C. Bourdin, A. B. Hamilton, R. Keene, T. Scotton; Treasurer and Secretary, E. J. Lovejoy, 73 Grove Street, Derby. **Devon and Cornwall Camera Club.**—Honorary Secretaries, Major Barrington Baker, H. M. Gun Wharf, Devenport; D. Roy, Bank Chambers, Plymouth. **Doncaster Microscopical and Scientific Society.**—Honorary Secretary, M. H. Stiles, Doncaster. **Dorset Amateur Photographic Association.**—Established 1886. President, W. Miles Barnes, M.A. (Cantab.); Secretary, Rev. E. J. Pope, M.A. (Oxon.). Bradford-Peverell Rectory, Dorchester. **Dukinfield Photographic Society.**—Established 1888. President, John T. Lees; Vice-Presidents, John Ashworth, John H. Brooks; Secretary, William H. Shirley, Commercial Buildings, King Street, Dukinfield. **Dundee and East of Scotland Photographic Association.**—Established 1879. Patron, The Right Honorable The Earl of Strathmore; President, Dr. J. K. Tulloch; Vice-Presidents, J. D. Cox, J. Mathewson; Honorary Treasurer and Secretary, V. C. Baird, Broughty Ferry, by Dundee. **Edinburgh Photographic Club.**—Established 1881. Board of Management: Convener, Dr. John Thomson, R. N.; Treasurer, Thomas Wardale; Secretary, James C. H. Balmain, 13 Maitland Street, Edinburgh. **Edinburgh Photographic Society.**—Established 1861. Patron, H. R. H. The Duke of Edinburgh; President, Hippolyte J. Blanc, F. S. A. Scotland; Vice-Presidents, Thomas W. Drinkwater, M. D., F. C. S., William T. Bashford; Secretary, Hugh Brebner, 13 Maitland Street, Edinburgh. **Glasgow and West of Scotland Amateur Photographic Association.**—Established 1882. President, Ralph H. Elder; Vice-President, Archibald Watson; Secretary, William Goodwin, 3, Lynedoch Street, Glasgow. **Glasgow Photographic Association.**—Established 1862. President William Lang, Jr., F. C. S.; Vice-Presidents, R. Dodd and A. Robertson; Secretary, J. Craig Annan, 153 Sauchiehall Street, Glasgow. **Gloucester Photographic Society.**—Reconstructed 1887. President Walter B. Wood, Vice-President, W. J. Jenkins; Honorary Secretary. F. H. Burr, 8 Midland Road, Gloucester. **Halifax Photographic Club.**—Established 1881. President B. Rowley; Vice-Presidents, T. Illingworth and E. J. Smith; Hon. Secretary, W. Clement Williams, 13 Aked's Road, Halifax. **Hampstead Photographic Club.**—Established 1887. Honorary Secretary, B. W. Wild, Gladesmore, Willesden Lane, N. W. **Hartlepool and District Photographic Society.**—President, Thomas Richardson, M. P.; Honorary Secretary, C. J. Palmer, 2 Whitley Street, West Hartlepool. **Hastings and St. Leonards Photographic Society.**—President, Wilson Noble, M. P.; Vice-Presidents, Lord Brassey, of Bulkeley, K. C. B., Councillor Stubbs,

J. H. Blomfield, S. W. Bultz, M. Sullivan, M. Wright, W. Mayor, W. Shuter, Dr. Routh, Rev. A. M. Macdona, Rev. A. B. Cotton Joint Secretaries, T. J. Northy, F. S. Sc. and A. Brooker. **Herefordshire Amateur Photographic Society.**—Established 1888. President, Jas. Rankin, M.P. ; Honorary Secretary, John Parker, City Surveyor, Mansion House, Hereford. **Holborn Camera Club.**—Established 1887, under the name of "The Teachers' Photographic Society." President, W. Rice, 86 Fleet Street: Patron, Rev. A. Johnson, M.A., F.L.S. ; Secretary, Fred. Brocas, 86 Fleet Street, E. C. **Huddersfield Photographic Society.**—President, Surgeon-Major Foster; Honorary Secretary, H. M. Smith, 15 St. John's Road. **Hull Amateur Photographic Society.**—Established 1884. President, Sir A. K. Rollit, M.P.; Vice-President, C. F. Amos: Council, Edward Bolton, J. Chatham, E. H. Howlett, C. D. Holmes, J. Stothard, J. Walker; Treasurer, H. W. R. Smith; Secretary, D. W. Sissons, 84 Beverly Road, Hull. **Hyde Photographic Society.**—Established 1885. President, John Pennington; Vice-President, Dr. G. W. Sidebotham; Secretary, William H. Middleton, 120 Hyde Lane, Hyde. **Ipswich Photographic Society.**—Established 1888. President, J. Dixon Piper; Vice-Presidents, A. H. Cade and Frank Mason; Hon. Secretary and Treasurer, E. R. Pringle, 83 Berners Street, Ipswich. **Keighley and District Photographic Association.**—President, Major John Sugden, J.P.; Vice-Presidents, Messrs. A. Keighley and C. Barton; Hon. Secretary, J. Wm. Darling, Mechanic's Institute, Keighley. **Kendal Literary and Scientific Institution (Photographic Section).**—Established 1886. Chairman, F. W. Crewdson; Secretary, Charles E. Greenall, Prospect Kendal. **Lewes Photographic Society.**—Established 1888. President, J. G. Braden; Vice-President, J. Tunks; Hon. Secretary and Treasurer, E. J. Bedford, 10 St. John's Terrace, Lewes. **Lambeth Polytechnic Camera Club.**—Hon. Secretary, Thomas I. Bartrop, Ferndale Road, Brixton. **Leamington Amateur Photographic Society.**—President, Surgeon General Raking; Hon. Secretary, F. M. Gowan, 20 Bauchamp Square. **Leeds Y. M. C. A. Photographic Club.**—President, Godfrey Bingley, Esq.; Vice-Presidents, G. H. Jackson and R. Brooks; Hon. Secretary and Treasurer, F. Scaife. **Leicester and Leicestershire Photographic Society.**—Established 1885. President, George Bankart; Vice-President, S. S. Partridge; Secretary, Henry Pickering, Highcross Street, Leicester. **Leith Amateur Photographic Association.**—Established 1888. President, William Dougall; Vice-President, W. F. Walker; Hon. Secretary, A. D. Guthrie, 7 Pitt Street, Leith. **Leeds Photographic Society.**—Re-established 1881. President, T. W. Thornton; Vice-Presidents, Thos. Dawson, B. T. McKay; Secretary, S. A. Warburton, 12 Waverly Terrace, Leopold Street, Leeds. **Leytonstone Photographic Society.**—Hon. Secretary, J. W. Spurgeon, Brayton Villas, Leytonstone. **Literary Photographic Club.**—Established 1887. Hon. Secretary, R. A. R. Bennett, B.A., Walton Manor Lodge, Oxford. **Liverpool Amateur Photographic Association.**—Established 1863. President, A. W. Beer; Vice-Presidents, H. Lupton, Paul Lange; Hon. Secretary, Walter Hughes, 3 Lord Street, Liverpool. **London and Provincial Photographic Association.**—Trustees, J. Traill Taylor and J. B. B. Wellington; Hon. Secretary, F. A. Bridge, East Lodge, Dalston Lane, London, N. E. **London Social Camera Club.**—Established 1887. Hon. Secretary, Herbert Smith, 6 New Broad Street. E. C. **Loughborough Literary Scientific Society (Photographic Section).**—President, J. B. Colgrove, M.A.; Vice-President, W. C. Burdor; Hon. Secretaries, W. Clarke, W. T. Tucker, Herrick Rd., Loughborough. **Maidstone Amateur Photo-**

graphic Club.—President, J. E. Austen; Honorary Secretary, S. Bath. **Manchester Amateur Photographic Society.**—Established 1858. President, S. F. Flower; Vice-Presidents, J. Davenport, Rev. H. J. Palmer, M.A., H. Smith, William Stanley; Secretary, Randolph Orme Gilmore, 78 Cross Street, Manchester. **Manchester Camera Club.**—Established 1883. Honorary Secretary, Thos. T. Sefton, Seedley Range, Pendleton. **Manchester Photographic Society.**—Established 1855. President Sir Henry E. Roscoe, M.P.; Vice-Presidents, Canon Beechey, John Schofield, Abel Heywood, Jr., Allen Garnett, J. S. Pillott; Honorary Secretary, W. I. Chadwick, Brooklands, Manchester. **Newcastle-on-Tyne and Northern Counties' Photographic Association.**—Established 1881. President, Alexander S. Stevenson, J.P.; Vice-Presidents, J.P. Gibson and H. R. Proctor; Honorary Secretary, Edgar G. Lee, 11 Beverly Terrace, Cullorcoats, near Newcastle-on-Tyne. **Norfolk and Norwich Photographic Society.**—Established 1888. President, F. W. Harmer, Mayor of Norwich; Vice-Presidents, W. H. Dakin, Samuel Hoare, M. P., G. J. Newbegin; Honorary Secretary, Spaham Camp, Havelock Road, Norwich. **North Kent Amateur Photographic Society.**—President, J. C. Johnson, J. P.; Vice-President, E. J. Wall, Esq.; Honorary Secretary, G. W. Cobham, 3 Edwin Street, Gravesend. **North London Photographic Society.**—Established 1885. President, J. Trail Taylor; Vice-Presidents, A. Mackie and E. Clifton; Honorary Secretary and Treasurer, N. P. Fox, 2 Princess Terrace, Primrose Hill, N. W. **North Lonsdale Amateur Photographic Society.**—President, Rev. J. Gregson; Honorary Secretary, F. P. Heath, Ainsworth Street, Ulverston. **North Middlesex Photographic Club.**—Established 1888. President, John Humphries, F.S.A.; Vice-Presidents, H. Beckett and E. Trail Hiscock; Curator, G. R. Martin, Harringay Park, Granary, Greenlanes, Finsbury Park. **North Surrey Photographic Society.**—Established 1888. Honorary Secretery and Treasurer, Harold Senier, F.I.C., F.C.S., 88 Norwood Road, S. E. **Nottinghamshire Amateur Photographic Association.**—Established 1883. President, Henry Blandy, L.D.S., Edinburgh; Vice-Presidents, G. A. Bull and S. Wells; Secretary, P. E. Knight, 39 Burford Road, The Forest, Nottingham. **Oldham Photographic Society.**—Established 1867. President, John Greaves, Jr.; Vice-President, Tom Heywood; Secretary, Thomas Widdop, 19 Burnaby Street, Oldham. **Oxford University Photographic Club.**—Established 1884. President, G. S. Edwards, 16 Crick Road. **Paisley Photographic Society.**—Re-established 1885. President, H. H. Smiley; Vice-Presidents, Wm. James Donald, Robert Harris; Secretary, Thomas Rastoll, Inchinnan Road, Paisley, Scotland. **People's Palace Photographic Club.**—Established 1888. President, Sir Edmund Hay Currie; Vice-Presidents, E. Howard Farmer, F.C.S., F.I.C.; C. W. Hastings, Robert Mitchell; Hon. Secretary and Treasurer, William Barrett, 16 Clare Road, Forest Gate, E. **Peterborough Photographic Society.**—Established 1888. President, Dr. G. Kirkwood; Vice-Presidents, The Very Rev. the Dean, Rev. Canon Argles, Dr. T. J. Walker, J.P., Dr. J. M. Kennedy, J. H. Hetley, J. H. Pearson, E. Worthington; Hon. Secretary, A. W. Nichols, 11 Cromwell Road. **Photographers' Benevolent Association.**—Established 1873. President, J. Traill Taylor; Trustees, Captain W. de W. Abney, R.E., F.R.S., and W. S. Bird; Central Secretary, H. Harland, 83 Hawksley Road, Stoke Newington, N. **Photographic Club.**—Established 1879. Trustees, William Ackland and T. Charters White; Treasurer and Secretary, Edward Dunmore, 83 Corinne Road, Tufnell Park, London, N. **Photographic Convention of the United Kingdom.**—Established 1886. President, Prof. C. H.

Bothamley; Ex-President, Andrew Pringle; Secretary, J. J. Briginshaw, 128 Southwark Street, London, S. E. **Photographic Society of Great Britain.**—Established 1853. Patrons, Her Majesty the Queen and H. R. H. the Prince of Wales. President, J. Glaisher, F.R.S., F.R.A.S., 1 Dartmouth Place, Blackheath, S. E.; Vice-Presidents, Captain W. de W. Abney, C.B., R.E., F.R.S., F.C.S., H. P. Robinson, G. Spiller, F.C.S., F.I.C.; H. Trueman Wood, M.A.; Hon. Secretary, Captain A. M. Mantell, R. E.; Assistant Secretary, Edwin Cooking, 5A Pall Mall, S.W. **Photographic Society of India.**—President, Surgeon-General Sir B. Simpson, M. D.; Vice-President, Nawab Ashanallah Khan Bahaoor of Dacca; Hon. Secretaries and Treasurers, J. S. Gladstone and A. Flemming, 29 Chowringnee, Calcutta. **Photographic Society of Ireland.**—Established 1879. Officers, 1889. President, Sir Howard Grubb, F. R.S.; Vice-President, George Mansfield, J.P.; Hon. Secretary (*pro tem*), Matthew Hedley, F.R.C.V.S., 6 Royal Terrace, West Kingstown Co., Dublin. **Portsmouth Amateur Camera Club.**—Established 1888. President, B. Jeffrey; Vice-Presidents, H. Hickey and R. Carrick; Hon. Secretary, G. Knight, 12 Middle Street, Southsea. **Postal Photographic Club.**—Established 1886. Honorary Secretary, R. A. R. Bennett, Walton Manor Lodge, Oxford. **Postal Photographic Society.**—Established 1886. President, Horace Day, M.D.; Hon. Secretary, E. Herbert Drake, The Vestry House, Laurence, Pountig Hill, S. E., London. **Queensland Photographic Society.**—Established 1884. President, Hon. A. C. Gregory, M.L.C., F.R.G.S.; Vice-Presidents, Prof. J. H. Pepper, J. W. Sutton, W. C. Hume; Hon. Secretary, C. M. Allen, Diocesan Registry, G. Street, Brisbane. **Reading Amateur Photographic Society.**—Established 1889. President, Charles Stephens, Esq.; Vice-Presidents, Col. Hawkes, C. B. Berkeley Monck, Esq., Walter Palmer, Esq., Rev. A. Stnadidge, F. Wheeler; Secretary and Treasurer, J. Phillips, 10 Abbot's Walk. **Shaftesbury Photographic Social.**—Established 1888. President, G. Davidson; Vice-Presidents, A. Ibbetson and O. J. Holdes; Hon. Secretary, John B. Rintoul, 36 Brewer Street, Regent Street, W. **Sheffield Camera Club.**—Established 1888. President, T. H. Morton, M.D.; Vice-Presidents, B. W. Winder, F.C.S., G. E. Maleham; Hon. Secretary, Henry J. Hardy, F.C.S., 34 Bank Street. **Sheffield Photographic Society.**—Established 1876. President, T. Firth; Vice-Presidents, B. J. Taylor and J. Hunt; Honorary Secretary, Ernest Beck, Fairmont, Shoreham Street, Sheffield. **Shropshire Camera Club.**—Established 1886. President, E. Cresswell Peele, Esq.; Vice-President, J. R. Greatorex, Esq.; Hon. Secretary, W. W. Naunton, 9 The Square, Shrewsbury. **Southport Photographic Society.**—Established 1888. President, Benjamin Boothroyd; Vice-Presidents, W. Marsden and J. B. Walker; Secretary (*pro tem.*), Mr. Harper, Town Hall, Southport. **Southsea Amateur Photographic Society.**—Established 1888. President, L. G. Bonham Carter; Vice-Presidents, Lieut. C. E. Gladstone, R.N., and Capt. Lamb; Honorary Secretary, F. Lord, L.R.C.P., Wilton House, Landport Terrace, Southsea. **Stockton Amateur Photographic Association.**—Established 1886. President, C. Arthur Head, J.P.; Vice-President, W. W. Stainthorpe, M.D.; Secretary, Frank Appleby, Roslyn Terrace, Stockton-on-Tees. **Sun & Company.**—A postal photographic society for the monthly circulation and criticism of photographs. Application as to vacancies for membership should be sent to the Hon. Secretary, Martin J. Harding, 6 College Hill, Shrewsbury. **Sutton (Scientific Society) Photographic Club.**—Chairman, A. R. Wormald; Recorder, Mrs. Culverhouse. **Swansea Amateur Photographic Association.**—President, B. H. Morgan; Vice-President, W. E. Brown; Honorary Secretary, E. Ernest Morgan, 1 Eaton Crescent, Swansea. **Sunderland Photographic**

Association.—President, J. W. Mounsey; Vice-President, A. Stafford; Honorary Secretary, H. H. Pinkney, 55 John Street. **Surbiton Amateur Photographic Society.**—President, E. R. Shipton; Vice-President, W. Whitfield; Hon. Secretary and Treasurer, W. M. Robinson, Hollingbourne, King Charles' Road, Surbiton. **Tasmanian Photographic and Art Association.**—Established 1887. Patron, Sir R. G. C. Hamilton, K.C B.; Vice-Patrons, Sir Lambert Dobson and Dr. Agnew; President, Russell Young; Secretary, John F. Echlin. **Tunbridge Wells Amateur Photographic Association.**—President, F. G. Smart; Hon. Secretary, Harry Gibson, 12 Goods Station Road, Tunbridge Wells. **Ulster Amateur Photographic Society.**—Established 1885. President, Prof. Letts, Ph. D., F.R.S.E., F.C.S.; Vice-Presidents, A. Tate, C.E., and W. Swanston, F.G.S.; Hon. Secretary, C. E. Shaw, M.D., 14 College Square, East Belfast. **University College Photographic Society.**—Gower Street, London. Meetings on alternate Tuesdays during the session at 5 P.M. Hon. Treasurer, R. T. Plimpton, P. D.; Hon. Secretary, W. North, M.A. **Victoria Camera Club.**—President, A. M. Henderson, C.E.; Vice-Presidents, J. T. Cosgrave and H. F. Young; Secretary, C. F. Burrows, 5 Queen Street, Melbourne. **Wallasey Photographic Association.**—Established 1886. President, H. Wilkinson; Hon. Secretary, J. W. Gregg, Poplar Terrace, Liscard, Cheshire. **Walton (Liverpool) Photographic Society.**—President, George Latimer; Secretary and Treasurer, Jno. Kennedy. **Warrington Amateur Photographic Society.**—President, T. J. Down Esq.; Vice-Presidents, H. N. Houghton, Esq., H. E. Lees, Esq.; Secretary, Rev. J. A. Drummond, B.A., Stockton Heath, Cheshire. **Wellington Amateur Photographic Society.**—Secretary, W. Williams Wellington, New Zealand.—**West Kent Amateur Photographic Society.**—President, Andrew Pringle. Vice-President, A. R. Dresser; Hon. Secretary, Edward G. Adams, Holmleigh, Bexleigh, S. E. **West London Photographic Society,**—President, William England, 7 St. James Square, Notting Hill, W. Vice-Presidents, P. H. Emerson, B.A., M.B, Charles Bilton, B.A., Walter L. Colls, E. O. Fountain, M.D.; Hon. Secretaries, Theo. B. March "Pentillie," Elliott Road, Chiswick, John Alfred Hodges, 87 Chancery Lane, W.C. **West Surrey Amateur Photographic Society.**—President, J. Gale; Vice-Presidents, G Davison, W. Winsford, and J. L. Lyell; Hon. Secretary, John Watkinson, 42 Honeywell Road, Wandsworth Common. **Worcestershire Camera Club.**—Established 1888 President, Michael Thompkinson; Vice-Presidents, Albert Cowell and Arthur Comber; Secretary, William Ray, School of Science, Kidderminster. **York Photographic Society.**—Established 1888. President, Mr. Vincent; Secretary, F. C. Benson, 18 Russell Street, York. **Yorkshire College Photographic Club.**—Established 1883. President, C. H. Bothamley, F.I.C.; Hon. Treasurer and Secretary, Harry B. Hall, 20 Regent Terrace, Hyde Park Road, Leeds. **Yorkshire Philosophical Society (Photographic Section).**—President, W. Monkhouse; Vice-Presidents, Dr. Anderson and Dr. Hitchcock; Hon. Secretary and Treasurer, Henry R. Moiser, Heworth, Grange, York. **Amateur Photographic Association of Victoria.**—Meets at Royal Society's Hall, Melbourne, second Tuesday in each month. All amateurs made welcome at meetings. President, Edgar C. Bell; Hon. Secretary, J. H. Harvey, 97 Victoria Parade, East Melbourne.

Germany.

Deutscher Photographen Verein.—Est. 1870. President, Karl Schwier; Vice-President, Fr. Mueller; Secretary, O. Gebhardt. Address

Karl Schwier, Weimar. **Muenchen Photographische Gesellschaft.**—Established 1879. President, F. Werner; Secretary, Paul Zschokke, 31 Landwehr Strasse. **Photographische Gesellschaft zu Hamburg-Altona.**—Established 1873. President, G. Wolf; Vice-President, Th. Petersen; Corresponding Secretary, H. Book, 26 Berg Strasse, Hamburg. **Photographen Verein zu Nuernberg.**—Established 1879. President, Fr. Muscat; Vice-President, Fr. Schoeninger, Ludwig Strasse. **Schleswig-Holsteiner Photographen Verein.**—Established 1881. President, C. W. Koch; Secretary, Wilhelm Dreesen, Flensburg, Schleswig. **Verein zur Foerderung der Photographie.**—Berlin. Established 1869. President, Prof. Dr. H. W. Vogel; Vice-President, Dr. W. Zenker; Secretary, Prof. Schultz-Henke; Address, 124a Kurfuerstenstrasse, Berlin, W. **Photographischer Verein zu Berlin.**—Established 1863. President, Dr. F. Stolze; Vice-President, Dr. J. Stinde; Secretary, O. Becker. Address Dr. F. Stolze, 23 Salzufer, Charlottenburg. **Verein zur Pflege der Photographie Frankfurt a. M.**—Established 1888. President, H. P. Hartmann; Vice-President, Dr. R. Kruegener; Secretary, F. W. Geldmacher. Address H. P. Hartmann 70 Eckenheimer Landstrasse. **Rheinisch Westphaelischer Verein zur Pflege der Photographie.**—Cologne. Established 1876. President, Th. Creifelds; Vice-President, Th. Schoenscheidt; Secretary, Gust. Janssen. **Photographische Genossenschaft von Essen.**—President, E. Schink, Sr.; Secretary, E. Schink, Jr., Essen a. Ruhr. **Photographischer Verein Hannover.**—Established 1888. President, Major von Hammerstein; Secretary, H. Roeder, 31 Hildesheimer Strasse, Hannover II. **Deutsche Gesellschaft von Freunden der Photographie.**—Established 1888. President, Prof. Dr. H. W. Vogel; Vice-President, Lieutenant-Colonel Hedinger; Secretary, Dr. W. Zenker, 5 Bulow Strasse, Berlin, W. **Schlesische Gesellschaft von Freunden der Photographie.**—Established 1888. President, C. C. Schirm, 2 Museum Platz, Breslau. **Verein der Photographen-Gehilfen zu Berlin.**—Established 1876. President, Paul Meyer; Secretary, Edward Guenther, 57 Stralauer Strasse, Berlin, O. **Photographen Gehilfen Verein Chemnitz.**—President, Franz Schultz; Secretary, R. Kunardt, 53 Reich Strasse, Chemnitz, Saxony. **Photographen Gehilfen Verein Dresden.**—Established 1885. President, R. Apel; Secretary, Wald. Horn, 19 Kreuz Strasse, Dresden. **Verein der Photographen Gehilfen zu Magdeburg.**—Established 1887. President, E. von Flottwell; Vice-President, Rud. Welter, 27–28 Knochenhauerufer Strasse, Magdeburg. **Photographische Vereinigung zu Muenchen.**—Established 1887. President, Adolf Koestler; Secretary, Anton Eder, 48 Augusten Strasse.

Austria-Hungary.

Photographische Gesellschaft zu Wien.—President, Lieut.-Col. Ottomar Volkmer; Vice-President, Chev. Achilles von Melingo; Secretary. Prof. Fritz Luckhardt, 18 Tabor Strasse, Wien II. **Club der Amateur Photographen.**—Established 1887. President, Carl Srna; Vice-President, Dr. Fr. Mallmann; Secretary, Dr. Julius Hoffman. Address 4 Wallfishgasse, Wien I. **Verein Photographischur Mitarbeiter.**—Established 1882. President, I. F. Schaschek; Secretary, Carl Thiess. Address "Zum Goldnen Sieb," Paniglgasse, Wien IV. **Cesky Fotograficky Spolek** (Bohemian).—President, Josef Koppel, Vice-President, K. Chooyka; Secretary, A. Polnicky. Address 3 Stefausg, Prag. **Fenykepeszet Eggysulet** (Hungarian)—Established 1884. President, Alexander Streliczki; Vice-President, Sigmûm Horvath; Secretary, Anton Gortva, 40 Dohany Uleza, Buda-Pesth.

France.

Societe Francaise de Photographie.—Established 1854. President, Péligot (de l'Institute); Vice-President, Davanne; Secretary, E. Cousin, 76 Rue des Petits Champs. **Societe Photographique Toulouse.**—President, Sipière, Toulouse. **Chambre Syndicale de la Photographie.**—President, Léon Vidal, 10 Rue de Lancry, Paris. **Photo-Club de Paris.**—Address G. Rongier, 8 Place de l'Odéon, Paris. **Societe Nantaise de Photographie.**—President, Basher, 8 Rue St. Laurent, Nantes. **Societe Photographique du Sud-Ouest.**—President, De la Laurentie. Address F. Braun, Angoulême. **Societe Photographique du Nord de la France.**—President, Vibert, Address Au Musée Douai, Nord.

Belgium.

Association Belge de Photographie.—Four sections, respectively in Brussels, Ghent, Liege, Antwerp. President, Dr. I. Candèze; Secretary, O. Campo, 37 Rue Souveraine, Brussels.

Holland.

Amateur Fotografen Vereenigung To Amsterdam.—Established 1887. President, A. Schettema Beduin, Vice-President, L. I. Van Lier; Secretary, J. J. M. Guy de Coral, 64 Ludsdugracht Amsterdam.

Denmark.

Dansk Fotografisk Forening.—Established 1879. President, I. Petersen; Secretary, Ioh. Petersen, 34 Ostergade, Kopenhagen.

Sweden.

Svenska Fotografi-Amato Forening.—Established 1888. President, G. Tore Ericson, 8 Braunkyshogaten, Stockholm.

Norway.

Norsk Fotografisk Forening.—Christiania. Established 1881. President, L. Szacinski.

Russia.

Photographic Section of the Imperial Technical Association.—Established 1872. President, S. Levitsky; Vice-President, W. Sreznevsky. Address, 2 Pantelejmouskaja, St. Petersburg.

Italy.

Associazione degli Amatori di Fotografia.—President, Antonio Ruffe Duca d' Artalia; Vice-President, Augusto Ducros; Secretary, G. Gargiolli, 25 Via Poli, Roma. **Societa Fotografia Italiana.**—11 Piazza S. M. Novella, Florence. **Circolo Fotografico Lombardi, Milan.**—Established April 1, 1889. President, Prince G. Carlo di Molfetta; Secretary, Dott. Giuseppe Borghi; Via Larga, 28.

Switzerland.

Schweizerischer Photographen Verin.—Established 1886. President, F. Gysi; Secretary, K. Stephan, Winterthur.

Japan.

Photographic Society of Tokio.—President, His Excellency Viscount Enomato; Vice-Presidents, Prof. D. Kikuchi, Dr. W. S. Bigelow; Secretaries, Prof. H. Ishikawa, 5 Minami, Ichann, Tokio, or Prof. W. K. Burton, College of Engineering, Tokio.

Sandwich Islands.

Hawaiian Camera Club.—Honolulu. President, C. Hedeman; Secretary, A. W. Richardson, Campbell's Block, corner Front and Merchant Streets, Honolulu, H. I.

PHOTOGRAPHIC PERIODICALS.

AMERICAN.—Weekly.

The Photographic Times. W. I. Lincoln Adams, Editor; Prof. Charles Ehrmann, Associate Editor, The Photographic Times Publishing Association, 423 Broome Street, New York.

The Photographic Eye. C. Gentilé, Editor, Chicago, Ill.

Semi-Monthly.

Wilson's Photographic Magazine. Edward L. Wilson, 853 Broadway, New York.

Anthony's Photographic Bulletin. Prof. Charles F. Chandler, Editor. Dr. Arthur H. Elliott, Associate Editor. E. & H. T. Anthony & Co., 591 Broadway, New York.

Monthly.

The Photographic Times. (Monthly parts).

The St. Louis and Canadian Photographer. Mr. W. H. H. Clark, Editor. Mrs. Fitzgibbon-Clark, 3428 Chestnut Street, St. Louis, Mo., Publisher.

The American Journal of Photography. John Bartlett, Editor. Thos. H. McCollin, 635 Arch Street, Philadelphia, Pa.

The Beacon. Dr. John Nicol, Editor. The Beacon Publishing Co., Tribune Building, Chicago, Ill.

The American Amateur Photographer. F. C. Beach and W. H. Burbank, Editors. W. H. Burbank, New Brunswick, Maine.

The Boston Photographic Review. J. Mörch, Editor. S. Wing & Company, Publishers, Boston.

The Photographer. Dr. Arthur Le Boutillier, Editor. Denisen & Co., Cincinnati, O. (Established October, 1889).

Yearly.

The American Annual of Photography and Photographic Times Almanac. C. W. Canfield, Editor. The Scovill & Adams Co., 423 Broome Street, New York.

Photographic Mosaics. Edward L. Wilson, 853 Broadway, New York.

The International Annual. W. Jerome Harrison and Arthur H. Elliott, 591 Broadway, New York.

ENGLISH.—Weekly.

The British Journal of Photography. Henry Greenwood & Co., 2 York Street, Covent Garden, London.

The Photographic News. Piper & Carter, 5 Furnival Street, Holborn, London, E. C.

The Amateur Photographer. C. W. Hastings, 22 Buckingham Street, Strand, London, W. C.

Photography. Iliffe & Son, 3 St. Bride Street, Ludgate Circus, London, E. C.

MONTHLY.

The Journal and Transactions of the Photographic Society of Great Britain. London.

Transactions of the Edinburgh Photographic Society.—G. G. Mitchell, Hon. Secretary, 2 Baxtor Place, Edinburgh, Scotland.

Proceedings of the Glasgow Photographic Association. 207 Bath Street, Glasgow, Scotland.

The Photographers' World. Percy Lund & Co., Bradford, England.

The Camera. Wyman & Sons, 74 Great Queen Street, London, W. C.

The Photographic Art Journal. Messrs. Smith & Botwright, 6 Eldon St., Finsbury, E. C.

YEARLY.

The British Journal Photographic Almanac. London. H. Greenwood & Co., 2 York Street, Covent Garden, London.

The Year Book of Photography and Photographic News Almanac. London: Piper & Carter, 5 Furnival Street.

GERMAN.—WEEKLY.

Deutsche Photographen-Zeitung. K. Schwier, Weimar. Est. Oct. 1, 1877.

Photographisches Wochenblatt. Dr. F. Stolze, Berlin, Friedrichstrasse, 243. Est. 1875.

FORTNIGHTLY.

Photographische Mittheilungen. Prof. Dr. H. W. Vogel, Editor, 124 Kurfuersten Street, W., Berlin. Robert Oppenheim, Publisher, Berlin. Est. April 1, 1864.

Photographisches Archiv. E. Liesegang, Düsseldorf, Editor. Est. 1860.

MONTHLY.

Photographische Correspondenz. Ludwig Schrank, Haupt-strasse, 9, Vienna, Austria. Est. 1864.

Photographische Notizen. C. Schierer, 9 Tuchlauben, Vienna, Austria. Est. 1865.

Photographischer Beobachter. C. Groll, Guben. Est. 1880.

Der Photographische Mitarbeiter. Hans Lenhard, Vienna, Austria, Neu-Fünfhaus, No. 7 Neubaugürtel, Vienna. Est. 1885.

Photographische Rundschau. Editor, Chas. Scolik, Piaristengasse 48, Vienna, Austria. Publisher, W. Knapp, Halle, a/S. Germany. Begun Jan 1, 1887.

D r Amateur Photograph. Dr. Paul Liesegang, Düsseldorf. Begun Jan. 1, 1887.

Die Sonne. Est. 1888. Edt. and Pub., Otto Schwaben, Deutz. (Prussian Rhein-Province).

QUARTERLY.

Laterna Magica. Est. 1887. Edt. and Pub., E. Liesegang, Düsseldorf.

OCCASIONAL.

Photographischer Anzeiger (advertising). Friedr. Stern, Munich, Sendlingshofer Platz, 9.

Flugblätter für Practische Photographie und verwandte Fächer. Friedrich Stern, Munich.

Der Practishe Photograph. Julius Preiffer, Breslau, Lehmdamm, 64 (*defunct*).

Allgemeiner Anzeiger für Photographen. Ad. Krieg, Dresden.

YEARLY.

Deutscher Photographen-Kalender. Weimar. Editor, K. Schwier. Publisher, *Deutsche Photographen Zeitung.* Est. 1880.

Photographischer Almanach und Kalender. Düsseldorf. Ed. Liesegang. Est. 1860. Suspended, 1863–1882.

Jahrbuch für Photographie und Reproductionstechnik. Dr. Josef Maria Eder, Editor. Published by W. Knapp, Halle, a/S. Est. 1887.

Taschen-Notizbuch für Amateur Photographen, by Ludwig David and Charles Scolik. Est. 1888. Publ. W. Knapp Halle a/S.

FRENCH.—WEEKLY.

L'Amateur Photographe. G. Rongier, 8, Place de l'Odeon, Paris.

FORTNIGHTLY.

Le Moniteur de la Photographie. L. Vidal, 13, Quai Voltaire, Paris.

MONTHLY.

Bulletin de la Société Française de Photographie. Rue Louis le Grand, 20. Paris.

Le Progrès Photographique. 22, Passage des Petites-Ecuries, Paris. Leon Wolff, Editor. Est. 1884.

Revue Photographique. E. Letellier, Editor, 11 Rue des Pénitents, Havre.

Bulletin de la Société Photographique de Toulouse. Toulouse.

Journal de l' Industrie Photographique. Gauthier-Villars, 55 Quai d'Augustin, Paris.

Bulletin Official de la Société des Employés en Photographie. 15, Rue Breda, Paris.

Journal de la Photographie Applique aux Sciences d'Observation. 12 Rue Hautefeuille, Paris.

Bulletin de la Société Versaillaise.

Bulletin de la Société Photographique du Nord de la France. Douai. Adr. Au Mausée, Douai (Nord).

Bulletin des Sociétés Photographiques de France. Gabriel Rongier, Editor. Place de l'Ecole de Medicine, 4 Rue Antoine Dubois, Paris.

YEARLY.

Aide Mémoire de Photographie. Gauthier-Villars, 55 Quai d'Augustin, Paris, Publisher. C. Fabre, Editor.

L'Agenda de l'Amateur Photographe. G. Rongier, 8 Place de l'Odeon, Paris.

Carnet du Photograph-Amateur. Paris, J. Michelet.

Les Annales Photographiques. E. B. de Raymond et Charles de Thierry, Editors, 8 Passage des Petites Ecuries, Paris.

BELGIAN.—MONTHLY.

Bulletin de l'Association Belge de Photographie. O. Campo, 37 Rue Souveraine, Brussels.

DUTCH.—MONTHLY.

Tidschrift voor Photographie. A. W. Groote, Amsterdam.

De Navorscher op het Gebied der Photographie. Amsterdam.

Fotografisch Maandblad. Organ von der Amateur Fotografen Vereeniging, Amsterdam.

DANISH.—MONTHLY.

Beretninger fra Dansk Fotografisk Forening, Kopenhagen. J. Petersen, Ostergade, 34. A. E. M. Schleisner, Editor.

Fotografiske Meddelesser, Kopenhagen.

SWEDISH.—MONTHLY.

Fotografisk Tidskrift for Fackmän ook Amatören. Albin Roosval, Kolmar.

RUSSIAN.—MONTHLY.

Photographitscheski Westnik. Editor, Paul Olchin; Publishers, B. Saenger & Co., St. Petersburg.

Monthly Record of the Photographic Section Imperial Russian Technical Society. No. 2 Pantelemonskaja, St. Petersburg.

ITALIAN.—MONTHLY.

La Camera Oscura. G. Salvi, Prato, presso Firenze.

Rivista Fotografica Universale, Brindisi. (Irregular.)

SPANISH.—MONTHLY.

Boletin Fotografico. J. L. Lopez & Co., Box 213, Havana, Cuba.

Revista Fotografica Espanola y Estrangera. Gibraltar.

La Fotografia. Barcelona.

PORTUGUESE.

A Arte Photographica. Cirne & Co., Rue da Picaria, Oporto, Portugal.

Boletin da Academia Portugueza de Amadores Photographicas.

HUNGARIAN. (Magyar.)

Fényképészeti Közlöny. Monthly. Edited by A. Halász. Published by the Association of Photographers' Assistants. Buda-Pesth.

JAPANESE.

Sashin Shimpo (*Photographic News*). Edited by W. K. Burton. Tokio, Japan.

PHOTOGRAPHIC BOOKS PUBLISHED IN 1888-89.

AMERICAN.

The American Annual of Photography and Photographic Times Almanac for 1889. C. W. Canfield, Editor. New York: Scovill & Adams Company.

The Processes of Pure Photography. By W. K. Burton and Andrew Pringle. Publishers: The Scovill & Adams Company, New York.

Pictorial Effects in Photography. By H. P. Robinson. Publishers: The Scovill & Adams Company, New York.

A Dictionary of Photography. By E. J. Wall. Publishers: The Scovill & Adams Company, New York.

The Ferrotypers Guide. Tenth Edition. The Scovill & Adams Company, New York.

Photographic Printing Methods. By Rev. W. H. Burbank. Second Edition. The Scovill & Adams Company, New York.

The Modern Practice of Retouching Negatives. Fourth Edition. The Scovill & Adams Company, New York.

Twelve Photographic Studies—A Collection of Photo-gravures. Collected by W. I. Lincoln Adams. The Scovill & Adams Company, New York.

Photographic Mosaics for 1889. Dr. E. L. Wilson, Editor and Publisher, New York.

Photo-engraving, Photo-etching, and Photo-lithography. Dr. E. L. Wilson, Editor and Publisher, New York.

Modern Heliographic Processes. By Ernest Lietze, New York. Publisher: Van Nostrand.

A New Principle in Heliochromy. Fred. E. Ives, Editor and Publisher, Philadelphia.

The Lithographers and Photographers Dictionary. Publishers: Lithographers' and Printers' Publishing Company, New York.

CHEMICAL LECTURE NOTES. By Dr. Peter T. Austen. John Wiley & Sons, New York.

THE INTERNATIONAL ANNUAL OF ANTHONY'S PHOTOGRAPHIC BULLETIN FOR 1889. Dr. A. H. Elliot and W. J. Harrison, Editors. E. & H. T. Anthony & Company, New York.

A PHOTOGRAPHIC DICTIONARY. Publishers: E. & H. T. Anthony & Company, New York.

ENGLISH.

THE YEAR-BOOK OF PHOTOGRAPHY AND PHOTOGRAPHIC NEWS ALMANAC FOR 1889. Thomas Bolas, Editor. Publishers: Piper & Carter, London.

PICTURE MAKING BY PHOTOGRAPHY. By H. P. Robinson. London: Hazell, Watson & Vinney.

THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC AND PHOTOGRAPHERS' DAILY COMPANION, 1889. J. T. Taylor, Editor. London: Henry Greenwood & Company.

THE CHEMISTRY OF PHOTOGRAPHY. By Prof. R. Meldola, F.R.S. London: Macmillan & Company.

NATURALISTIC PHOTOGRAPHY. By Dr. P. H. Emerson. London: Sampson Low & Company.

THE BOOK OF THE LANTERN. By J. C. Hepworth. New York: Edward L. Wilson.

GERMAN.

DER DEUTSCHE PHOTOGRAPHEN KALENDER FOR 1889. Vol. IX. Karl Schwier, Editor and Publisher, Weimar.

PHOTOGRAPHISCHER ALMANACH FOR 1889. E. Liesegang, Editor and Publisher, Düsseldorf.

DER LICHTDRUCK UND DIE PHOTOGRAPHIE. By Dr. Jul. Schnauss. Fourth Edition. Düsseldorf, 1889: E. Liesegang.

DER KOHLEDRUCK UND DESSEN ANWENDUNG BEIM VERGROESSERUNGS VERFAHREN. By Dr. Paul Liesegang. Ninth Edition. Düsseldorf: E. Liesegang.

DIE PROJECTIONS-KUNST. Ninth Edition. Düsseldorf, 1889: E. Liesegang.

DIE PHOTOGRAPHIE. By I. F. Schmidt. H. Hartleben, Vienna and Leipzig.

DAS PHOTOGRAPHIEREN. By T. F. Schmid. A. Hartleben, Vienna and Leipzig.

DAS ARBEITER MIT GELATINE EMULSION PLATTEN. J. F. Schmid, Vienna, 1889.

TASCHEN NOTIZBUCH FÜR AMATEUR PHOTOGRAPHEN. By Ludwig David and Charles Scolik. Second Edition. Publisher: Wilh. Knapp, Halle, a/S.

AUSFUEHRLICHE ANLEITUNG ZUR HERSTELLUNG VON PHOTOGRAPHIEN. By Paul Goerz. Berlin: Robert Oppenheim.

DIE KUENSTLERISCHE PHOTOGRAPHIE. C. Schindle. Publisher: T. Hartleben, Vienna and Leipzig.

DIE PHOTOGRAMMETRIE ODER BILDMESSKUNST. By Dr. C. Koppe, Weimar, 1889. Publisher: Karl Schwier, Weimar.

UEBER AEHNLICHKEIT IN DER PORTRAIT PHOTOGRAPHIE. By Hans Arnold. Karl Schwier, Weimar.

DIE AMATEUR PHOTOGRAPHIE. By Robert Talbot, 1889. Berlin: Romain Talbot.

PHOTOGRAPHISCHE PORTRAITURE. By Charles Scolik, Vienna.

ANLEITUNG ZUR PHOTOGRAPHIE FUER ANFAENGER. Capt. G. Pizzighelli. Publisher: Wilh. Knapp, Halle, a/S.

LEHRBUCH DER PHOTOGRAPHISCHEN CHEMIE UND PHOTHOCHEMIE. Editor and Publisher: Alexander Lainer, Vienna.

JAHRBUCH FÜR PHOTOGRAPHIE UND REPRODUKTIONSTECHNIK. Herausgegeben von Prof. Dr. Josef Maria Eder. Für 1888. Zweiter Jahrgang Mit 109 Holzschnitten und Zinkotypien im Texte und artistischen Tafeln. broch. 5 M.

DAS LICHT im Dienste wissenschaftlicher Forschung. Von Sigmund Theodor Stein, Docter der Philosophie und Medizin, konigl. wurttemb. Hofrath. Zweite gänzlich umgearbeitete und vermehrte Auflage. II. Band. 6. Heft. Die photographische Technik für wissenschaftliche Zwecke. Mit 67 Textabb. 1888. 3 M.

ANLEITUNG ZUR POSITIV- UND NEGATIVE-RETOUCHE. Herausgegeben und durch pratische Beispiele erläutert von Carl Zamboni, Maler und Photograph. Mit 9 Lichtdruck-Tafeln. gr. 8. 1888. 5 M.

DIE PHOTOGRAPHIE FÜR LIEBHABER. Darstellung der einfachen photographischen Verfahren für Liebhaber. Von Erich Zschetzschingck. Mit 45 Abbildungen. gr. 8. 1888. 3 M. Verlag von Wilhelm Knapp in Halle a/S.

DIE RETOUCHE PHOTOGRAPHISCHER NEGATIVE UND ABDRÜCKE. Mit Abbeldungen, Probedruck und anatomischen Zeichnungen von Prof. A. Mücke. Dusseldorf: Ed. Liesegang, 1888.

FRENCH.

LES PORTRAITS AU CRAYON AU FUSAIN ET AU PASTEL. C. Klary. Paris: Gauthier-Villars et Fils, 1889.

LES LEVERS PHOTOGRAPHIQUES ET LA PHOTOGRAPHIE EN VOYAGE. Dr. G. La Bon. Gustave. Paris, 1889: Gauthier-Villars.

LA PHOTOGRAVURE FACILE ET A BON MARCHE. L'Abbé J. Ferret. Paris: Gauthier-Villars et Fils, 1889.

MANUEL PRATIQUE DE PHOTOGRAPHIE. Par A. Rossignol. Gauthier-Villars et Fils, Paris.

TRAITÉ PRATIQUE DE PHOTOGRAPHIE EN EMAIL, SUR PORCELAIN ET SUR VERRE. Par Geymet. Paris, 1889: Gauthier-Villars.

TRAITÉ DE GALVANAPLASTIE ET D' ELECTROLYSE. Par Geymet. Paris, 1889: Gauthier Fils.

HELIOGRAPHIE VITRIFIABLE, TEMPRATURES, SUPPORTS PERFECTIONNÉS, FEUX CALORIS. Par Geymet. Paris, 1889: Gauthier-Villars.

NOUVEAU GUIDE PRATIQUE DU PHOTOGRAPHIE AMATEUR. Par G. Vieulle. Second Edition. Paris: G. Villars.

TRAITÉ ENCYCLOPÉDIQUE DE PHOTOGRAPHIE. Par C. Fabre. Gauthier-Villars et Fils, Paris.

NOTICE SUR LA CUVETTE-LABORATOIRE pour développer et fixer les clichés au gélatino-bromure d'argent, sans laboratoire spécial et en pleine lumière. Br. in-18 de 34 pages. 1887. 1 fr. G. Bourgougnon. Paris: J. Michelet.

AIDE-MÉMOIRE DE PHOTOGRAPHIE pour l'anné 1888 (13^e année). 1 vol. in-18 br. Le même, cart. percal. C. Fabre.

LA PHOTOCOPIE, ou procédés de reproductions industrielles par la lumière d'une façon rapide et économique. 1 vol. in-18, br. A. Fisch.

PROCÉDÉS PHOTOGRAPHIQUES AUX COULEURS D'ANILINE, application sur vitraux, sur nacre et sur ivoire. 1 vol. in-18, br., 1888. Geymet.

NOUVEAUX APERCUS sur la gravure héliographique de la demi-teinte. 1 vol. in-18, br., 1888. Geymet.

CARNET DU PHOTOGRAPHE-AMATEUR á l'usage des voyageurs et des touristes pour l'année, 1887, élégant carnet de poche oblong, cart. percaline. Ch. Jacob.

PHOTOGRAPHIC SCHOOLS OF INSTRUCTION.

American.

UNIVERSITY OF CHAUTAUQUA. SCHOOL OF PHOTOGRAPHY. Hon. Lewis Miller, *President;* Right Rev. Dr. J. H. Vincent, *Chancellor;* Miss Kate F. Kimball, *Secretary;* Prof. Charles Ehrmann *Instructor.* 1. *Corresponding Class.*—Printed Lessons; Reading of Hand-books; Instructive Correspondence. 2. *Practicing Class.*—Practical Exercises in Field and Studio; Theories; Public Lectures; Colloquies. 3. *Local Class, New York.*—Demonstration on Practical Photography; Theory of Photochemical Processes; Preparation of Photographic Chemicals. 4. *Corresponding Class* (*Second Course*).—Prescribed Reading; Chemistry; Optics. Examination in all Classes, Diplomas.

Under Chautauqua authority:

MOUNTAIN LAKE ASSEMBLY, MD., CLASS IN PHOTOGRAPHY. Profs. Charles F. Himes and Lyons.

SCHOOL OF PHOTOGRAPHY OF BAY VIEW, MICH., ASSEMBLY. M. H. Hall, *Superintendent..*

Instruction is also given in Photography at Wilson College, Chambersburg, Pa., by Miss Harriet Seymour; at Montclair, N. J., High School, by Randall Spaulding; at Lehigh University, Pa, and Cornell University, New York, by Prof. Spencer Newberry.

European.

BERLIN PHOTOGRAPHICAL LABORATORY OF THE POLYTECHNICUM IN CHARLOTTENBURG, BERLIN. Prof. Schlichting, *Director.* Prof. Dr. H. W. Vogel *Instructor.* Chemistry, Physics, Drawing, Practical Exercises and Photo-mechanical Printing Methods.

Braunschweig Department of Polytechnical School. Prof. Dr. C. Koppe and Dr. Max Muller. Theory and Practice; Photo-micrography; Photo-grammetry.

Karlsruhe. Prof. Dr. Schuberg. Theory and Practice in Studio and Field; Lectures.

Munich. Dr. M. Th. Edmann. Photography Applied to the Mechanical Arts.

Schloss Grönenbach, Bavaria. W. Cronenberg. Mechanical Printing Methods; Wet and Dry Processes.

Vienna Imperial Polytechnicum. Prof. Dr. Joseph M. Eder. Elements of Photography and Photo-chemistry; Reproduction Methods.

Vienna Imperial Institute for Photographic Practice, Reproduction Methods, and Mechanical Printing. Prof. Dr. Joseph M. Eder, *Director*. Profs. Hanns Lenhardt, Alex. Lanier, I. Hörwarter, C. Jasper, *Instructors*. Two Courses of Instruction. Drawing; Chemistry; Optics; Theories of Photographic Processes. Retouching Positives and Negatives; Mechanical Printing Methods.

Zurich, Switzerland, Federal Polytechnicum. Prof. Dr. I. Barbieri, *Director*. Theory and Practice; Photo-micrography a Specialty.

HOTELS HAVING DARK-ROOMS FITTED FOR USE OF TOURIST PHOTOGRAPHERS.

CALIFORNIA.
East Pasadena—The Raymond.
Monterey—Del Monte.
Santa Barbara—San Marco.
San Diego—Hotel Coronado.

NEW YORK.
Adirondacks—Cascade Lake House. Has a dark-room with running water.
Big Indian, Catskill Mountains—Slide Mountain House.
Blue Mountain Lake, Hamilton County—Prospect House.
Lakewood—The Stillingsworth.
Lake George—Fort William Henry Hotel.
Lake George, Bolton—Lake View House.
Kidders Ferry, Cayuga Lake—Coles Hotel.
Niagara Falls—Spencer House.
Hunter—Breese Lawn. Has a dark-room with running water.
Westport—The Westport Inn. Has a dark-room with running water.

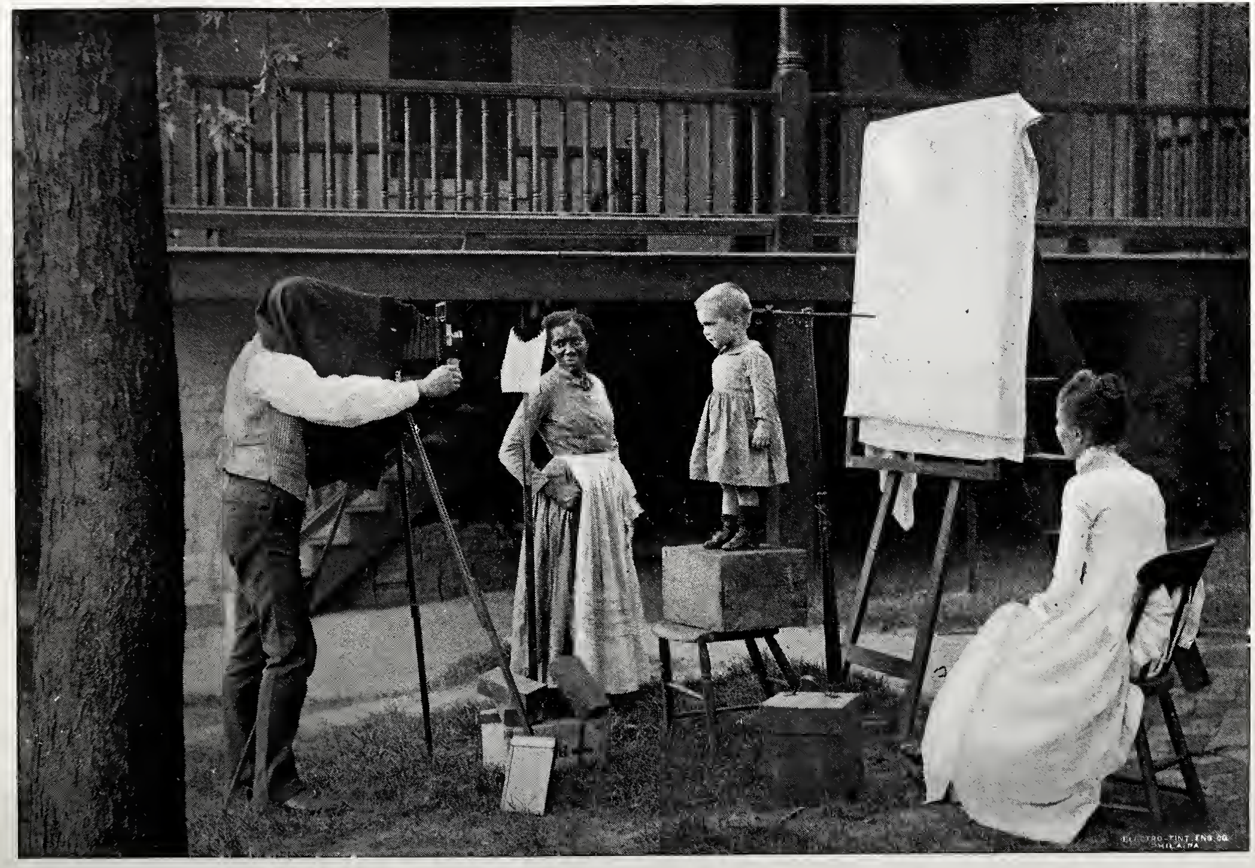
NEW HAMPSHIRE.
Littleton, Cheswick—Inn.
White Mountains—Profile House.

NORTH CAROLINA.
Hot Springs—Mountain Park Hotel.

ONTARIO.
Muskoka, Lake Joseph—The Stanley House.

PENNSYLVANIA.
Dingman's Ferry—High Falls House.

VIRGINIA.
Luray—Luray Inn.



Photographed by Robert E. M. Bain. AN IMPROVISED STUDIO. Electro-Tint Engraving Co., Phila

THE
AMERICAN ANNUAL OF PHOTOGRAPHY,
AND
PHOTOGRAPHIC TIMES ALMANAC.
1890.

REVIEW OF THE YEAR.

The difficulty of presenting any summary of the progress made since the last number of the Annual was offered to a waiting world is not that of treating the subject exhaustively, but of selecting and condensing; to embrace in one view the wide area of its ever-increasing domain, all the improvements in glass-making and lens-calculating must needs be utilized.

Before the attempt to note a few of the steps of progress is made, a few words as to the illustrations of this and future volumes may be pardoned. Though reaching, in point of numbers and general excellence, a higher mark than ever before—(and modesty alone, not the fear of unfavorable result, forbids comparisons with previous issues, to say nothing of other publications in the same field) our standard is high and constantly growing higher. Next year we desire and expect to reach a still greater eminence in photographic illustration than this year; and to accomplish this universally satisfactory result we desire the assistance and co-operation of all our readers, to which end we invite contributions of prints from their best negatives, accompanied by name and address of sender, title, and other particulars of the picture.

This friendly competition will undoubtedly result in stimulating much good work throughout the ensuing year; and we shall all be benefited by it.

As one subject for those who will care to make something especially, we would suggest the laudable and patriotic one of "Our national flower." Discussion has been very prevalent in the literary form; let us add toward the final decision the powerful aid of photography and make the next ANNUAL a "national flower" number. Let the admirers of the Mayflower, the mountain laurel, the daisy, the dog-wood, and the golden rod, or the tulip tree, and all the others on the list, champion their choice, and demonstrate the simplicity or grace or whatever other characteristics they claim for their favorite by aid of "the pencil of nature," as Fox-Talbot picturesquely denominated photography, nearly half a century ago. If this winter season is not suitable for securing the results, it may at least be profitably utilized in thinking out methods of treatment to be applied when spring and summer, with their cargo ofblossoms, shall again be with us.

Packages containing prints should be marked "For Annual," and should be sent to the Editor, in care of the publishers, not later than September 1, 1890.

Those photographs not selected for illustrating the ANNUAL, if suitable for *The Photographic Times*, may be brought out in that periodical if agreeable.

In the way of popularization of photography, the year has been remarkable. To say nothing of the toy cameras, of which one firm is said to have sold near fifteen thousand, the newspaper as well as the periodical press has taken the matter up in a very enthusiastic way. Many of the popular dailies in our great cities have a photographic column as often as once a week, and the general public is thereby very much interested. The comic papers touch on photographic subjects; the magazines have articles on photography, and in general the prospects may be said to be of the brightest character.

In the way of developing agents hydrochinon, of which so much was predicted a year ago, is not so extensively used at present, if general report is to be believed; while ferrous oxalate has dropped almost entirely into the background except for positive and lantern-slide making. Even pyro, which we thought our old stand-by, is threatened in its supremacy by eikonogen, the new developing agent. This is one of the aniline derivatives, not far from kin to pyro and hydrochinon, and although of only recent introduction, seems to have made very favorable impression. The best method of its use is doubtless not yet settled upon, but many of the numerous formulæ give satisfactory results.

In the way of negative materials, the new film of The Eastman Co. deserves special notice on account of its novelty and general excellence. While drawbacks will undoubtedly be met with in practice by those who utilize it—such as curling up of films when taken out of the frame after printing—these will doubtless be done away with before a great while if the other points prove to be useful and desirable. Of course nothing can be lighter in the way of photographic apparatus than a camera, detective or other, fitted with a roll-holder in which the film takes the place of the paper.

Composite photography has attracted some attention, and a new application of it has been made in astronomy. Professor Todd showed at a recent session of the Academy of Science that composite photography had been used in securing a photograph of the sun's corona that can be considered as reasonably accurate. Composite photographs has collected many of the best pictures of the sun's corona and combined them. This one combined picture presents the features in which all or many of the drawings made by astronomers agree.

In the way of meetings of learned and other bodies interesting to photographers may be cited the Boston Convention of the P. A. of A., which, though not so largely attended as in some years, bore excellent fruit, including a project for the erection of a bust of Daguerre.

The International Photographic Congress, which met at Paris for a week during the Exhibition, considered a number of subjects, which are mooted points, and it is to be hoped that ultimately some definite results may be reached, though none are at present evident.

The joint exhibition of the New York, Boston and Philadelphia societies, held at Philadelphia early in the year, was a fine display of photographic work. One of the things noted there was the large number of what may be called grotesque photographs, such as a man playing checkers with himself, holding his head in his hands, and others of the same character.

The following is the description of a method of making ghost photographs, etc., the subject given being a group, seated at a table playing cards, with a ghostly figure threatening them with outstretched arm.

Hang a wet sheet between camera and the group; remove the cap just as a man rushes between the sheet and the group and holds his arms out toward them; then replace cap and drop the sheet; take off cap again and photograph the group on the same plate with the shadow caught from the sheet. This makes as natural looking a ghost as one ever saw.

Considerable has been said, and written also, about photography without the dark-room; in other words, development in open day by white light, and a special apparatus for use in this manner has been devised and put on the market, but it remains to be seen just how successful it will be.

Professor Hastings, of New Haven, has announced a still further improvement in the manufacture of optical glass by which chromatic aberration has been reduced to one-twentieth of what it is in the old telescopes. By the use of this material astronomical photographs can be taken without the aid of a special eyepiece.

Another very important thing for astronomical photography in this country, is the gift received during the year by Harvard College from Miss C. W. Bruce, a New York lady, of fifty thousand dollars to be applied to the construction of a photographic telescope having an objective of about 24 inches aperture with focal length of about 11 feet. The object glass will be a compound portrait lens. The negatives made with this instrument will be 13 inches square, and will cover a portion of the sky 5 degrees square on a scale of one minute to a millimetre.

The literature of detective cameras is constantly furnishing new contributions to contemporary fiction. Witness the following, anent "The Demon Detective Camera," of English origin, offered at the small price of a dollar and a quarter.

"The DEMON CAMERA is the wonder of the Photographic world. It is a genuine scientific victory over difficulties; by its use the momentary event which may be full of importance, or bursting with comicality, may be permanently secured and used at will, for pleasure, profit, or revenge. The most marvellous thing about the apparatus is its price, nothing to compare with it being obtainable at less than 2 or 3 guineas."

Evidently picture-making qualities are subsidary to cheapness. We can well imagine that the results do not belie the name of the camera.

WE have endeavored to bring a descriptive article opposite each illustration, but that has been impossible in every case. The illustration entitled "An Out-of-door Studio," which appears opposite page 33, will appeal to the heart and imagination of every owner of a camera. Almost the first object on which a new purchaser exercises his skill, or want of it, is some long-suffering member of his family, or circle of friends. Sometimes it is the patient wife, who, in addition to the "litter" in bath-rooms and closets, shocking to her housewifely soul, is often in addition posed as subject, at least until a few of the results have been seen. Frequently it is the complaisant friend who is pressed into the service, occasionally a small brother or sister is made to toe the mark; but it is the household baby that feels to the fullest the pangs of being "taken."

The well-known president of the St. Louis Camera Club, Mr. R. E. M. Bain, has evidently appreciated the humorous side of this otherwise solemn fact, and his success in recording one phase of the subject speaks for itself. The uncomfortable but obedient youngster, the interested mamma, the delighted nurse, the "operator" whose anxiety is betrayed by his very attitude, even though his face is hidden beneath the mysterious black cloth, the improvised studio apparatus and accessories, appealing mutely to the recollection of every amateur who has "been there"—are all characteristic.

The process-block, made by the Electro-tint Engraving Co., is an excellent piece of work, and speaks well for the possibilities of their process.

The portrait of Edison, the frontispiece, from a negative by Falk gives an excellent idea of this prominent figure in the electric science of to-day, from whom photography will benefit if his promised Photophone one day shall become an accomplished fact. To supplement this we ought really to have the portrait of him taken at the Paris Exhibition by aid of his own electric light by a well-known American photographer.

The fine half-tone reproduction is from the establishment of Geo. M. Allen & Co., new-comers to the ANNUAL, to whom we can pay no higher compliment than that their gem is worthy of the setting.

AT THE BARRACKS, from the painting by Meissonier in the Stewart collection, was made by William Kurtz, Esq., of Madison Square, New York, of whose work we are fortunate enough to show several specimens to the readers of this volume.

The characteristics of the artist are pre-eminently shown in this great work, which brought an enormous price.

The method adopted in Mr. Kurtz's reproduction "atelier" is that of Meisenbach, which renders the photographic half tones by transverse lines and double exposure, thus making the reproduction capable of being etched in high relief.

Many photo-mechanical printers have adopted Meisenbach's method, but of all of them Mr. Kurtz, so far, stands foremost in the quality of work. Through his ingenuity and artistic accomplishments he is enabled to produce results, which but a short time since were deemed to be impossible and which earn them high rank in the graphic arts.

THOROUGHNESS.

Much of the best work one sees is done by so-called amateurs. In fact, good work can only be done by amateurs in the true sense; *i. e.*, those who love their work, and the secret is *thoroughness.* One must be thoroughly interested in the work—make a thorough study of the subject, and have nerve enough to keep the holder out of the camera unless the light is satisfactory and the composition thoroughly good. The "you press the button and we do the work" method is often effective, but for plates of any size more often a waste than a gain.

Very frequently we see picture makers who carefully read and observe the instructions sent by the makers with each box of plates, and the result is favorable. I envy them their pictures and the ability to stick to instructions, but I can't do it myself. I confess to having little interest in a picture after the first batch of prints, or even after the negative has shown its quality—for the chemistry and other details of the subject exhaust most of my zeal.

It has been my pleasure to incite some hundreds of persons to try the various branches of photography, pure and simple, while I have done some work in every branch from wet-plate to photo-engraving, and the criticisms here made apply equally to myself.

I am a "hit or miss" portraitist, but am dead sure on some other branches said to be more difficult.

Most people fail in their efforts in some direction, as is quite natural. Those who stick to one class of photographs usually make a success.

I like to watch others work, and my experience is that failures are due to lack of thoroughness at some stage.

We used to groan over the bath, but now-a-days we call on the plate maker and lay down the cash after he has done the work, and then anathemize him if we don't understand how *he has done it,* with that especial emulsion.

The *art* of photography ends when the slide is drawn. Before that the artistic eye must compose the picture and see in advance what is to come, (barring the color tone) provided the optical guesses as to stop and time have been about right. There can be no thorough up to this point; it is all taste and judgment.

Then comes the technical work of catching the re-arranged molecules of bromide of silver, and of piling them up in the gelatine in that harmonious way that will make a crisp and brilliant negative.

We must think of the plate as "over" or "under-exposed," or "about right," and so compound the developer.

That everything should be thoroughly clean—(chemically clean if not pretty)—ought to go without saying; but, alas! it needs to be said of something about everyone's work I know. Graduates, beakers, pans, lips of bottles need eternal vigilance and the bichromase of potash and sulphuric acid solution (recommended by Carey Lea in his Manual of Photography) bichromate and sulphuric acid washing solution cannot be too much commended to chemically clean all implements from decomposing organic matter.

Perspiration exudes from the fingers and is of uncertain chemical re-action. Fingers dipped in developer should be washed at once, for this developer becomes oxydized, and is a source of pollution to that in the pan.

Developer should be spread thoroughly and evenly over the plate, and be kept moving over it gently.

In the gelatine plate developers do not dissolve the salt, but the developer is reduced in proportion to the number of molecules of salt reduced to metallic silver. The motion of the solution sends new particles of the developer over the aggregation of molecules of sub-salt, thus keeping up the action. A gentle motion does this thoroughly, while too active a motion tends to harshness of the negative, and by breaking the surface into bubbles causes speedy oxydation and muddiness.

If the solution remains quiescent on the plate the developer will be reduced locally, and the result will be seen in crapey mattings, more especially in the sky and other high lights which consume extra amounts of pyro.

When the plate has reached a stage of development which satisfies our judgment, we owe it a thorough clearing, and as thorough a washing. I have used a grooved box bath for hypo for years, in which the plates "clear,"—after this they are washed and then hypoed in a fresh solution to clear them of tetrathionate of silver, which is as bad for a negative as nitrate of silver.

For washing, nothing equals a rippling stream gently flowing over the surface, as the hypo which is dialysed out of the gelatine is immediately washed away; but for a number of plates a washing box is best. My preference is for a shelf arrangement, gelatine down and stream crossing through the pile of plates.

All this is not new, but the struggle for new *everything* is so intense that the old is lost sight of. As "cleanliness is next to Godliness" so it is essential in any *delicate chemical re-action*, and thorough cleanliness, thorough care in details, from dusting a plate to washing it, are necessary to making a good negative.

J. W. MacMurray.

HOW TO SEE PHOTOGRAPHICALLY.

Of the seven colors of which white light is composed, three—the red, orange, and yellow—have little effect upon the bromide of silver with which our ordinary dry plates are coated. Three others—blue, indigo, and violet—have a very marked and powerful effect, while the green may be consider intermediate, linking the chemically active to the inactive rays.

Now of these seven colors it is the *yellow* ray, which makes the most powerfnl impression upon our eyes. In looking at any landscape, building, or person, it is the yellow rays (and those adjacent to the yellow in the spectrum) which chiefly impress us.

The natural result of this is, that the picture produced upon a dry plate (the work mainly of the blue, etc., rays) is generally very different from that which we perceived; and this often causes great disappointment. In the scene, as we beheld it, masses of golden furze or purple heather may brighten up dark hillsides; or the reds and yellows of autumnal foliage may densify long stretches of woodland. On the bromide plate all comes out equally dark and black.

How can we remedy this?

It may be done in two ways. The first way is to make the plate sensitive to the same rays as the eye. This is done in the so-called isochromatic or orthochromatic plates by dyeing the silver bromide, and by using a yellow screen in the diaphragm slit. But such plates are expensive, more difficult to develop, and, as a rule, do not keep well.

The other expedient is *to assimilate the eye to the plate by wearing a pair of blue spectacles; by using a sheet of blue glass to look through; by substituting a focusing screen of blue glass for the ordinary one; and by using a blue screen in the diaphragm slit.*

When one or more than one of these methods is tried, it is surprising how the character of the object which we propose to photograph will often be altered. Objects will assume the values by which they will be represented on the sensitive plate, and our impressions will often be greatly altered.

W. Jerome Harrison, F. G. S.

EIKONOGEN.

It is really refreshing to come across *anything* new in photography, and hard to hit upon anything that some fellow with a good memory shall not jump up and declare that Tom, Dick, or Harry recommended ever so long ago. Eikonogen may, or may not, be an exception to the rule. Dr. Andresen, so far as I know, has kept his thumb upon its formula, and till we know a little more of what it is we cannot say. It is said to have been patented in this country, and if so, somebody who has access to the records of the patent office, will soon tell us all about it; or if, not, some other fellow, clever with test tubes, will doubtless reveal the secret.

In the meantime, however, we are more interested in what it does than what it is, and I want the many readers of The American Annual of Photography to know how it has behaved in my hands. I was favored by what may be called an advance sample, and, through the kindness of a German friend, a translation of the instructions and formula issued by the inventor, and set about putting both to the test of practical experiment. This very soon showed that although the material itself was very promising, the proportions recommended were, so far at least as my use was concerned, altogether unsuitable. I belong to the slow coach school, and have never seen, and do not believe I ever shall see, a negative in which the highest possibilities have been reached by rapid development, and so from about twelve grains to the ounce, which gave flat, thin results, I wrought it down to two or three grains, and bright, brilliant negatives, full of delicate gradation and rich in sparkling contrast were the result.

The limits of an Annual article will not admit of my going into all the details of the experiments, and so I shall merely give the formula that I have found in every way satisfactory, and mention two different ways of working, to neither of which I can give a preference, as both seem equally good.

A.—Eikonogen	1	ounce
Sodium sulphite	2	ounces
Water	20	ounces
B.—Sodium carbonate	1½	ounces
Water	20	ounces

C.—	Sodium hydrate	1 ounce
	Water.	10 ounces

For the one, and probably the simpliest of the two methods of development take of A one ounce, B one ounce, and water two ounces. With this, on a fairly exposed plate of Carbutt, Cramer, or Seed, all three of which I have at present in use, the image will appear, in less than a minute, and development will be complete in from two to five minutes. It seems to me that the addition of a bromide, under any circumstances, is not advisible, or necessary, as all that it is generally expected to do can be done by modification in the proportions of A, and B, density and contrast being favored by diminishing B, or increasing A, and *vice-versa.*

For the second method of development, which is probably best adapted for known over-exposures, take one ounce of A, and three ounces of water. Let the plate remain in this till the image is fully but faintly out; which may take from three to five minutes, and then add ten minims—one grain sodium hydrate—of C. If this should not give sufficient density in two or three minutes it may be repeated at least to the extent of three times—one grain sodium hydrate to each ounce of the developer—which will give a result in every way satisfactory.

The developer made by A and C, will not keep after being mixed, nor is it advisable to attempt the development of several plates in succession in one solution, but the mixture of A and B, keeps well and retains its activity even after having developed at least half a dozen plates.

John Nicol, Ph.D.

THE ETHICS OF HAND CAMERAS.

With the advent of the numerous styles of small and inconspicuous hand cameras, there has arisen a matter of some social importance and interest to photographers. The temptation to photograph anything and everything, regardless of the approval or wish of the subject, and in many cases without informing him of the fact that he has been photographed at all, is a matter which is so easy to cultivate and so difficult to resist that a little talk about the right and wrong of the case may be timely.

How often has the tourist heard the snap of a shutter and looked up to discover by the satisfied grin on the face of some cub of a boy that he, or she, has been photographed in some embarrassing position, and that entirely without his consent or control his picture is to be examined and discussed by entirely unknown and unwelcome critics? Any attempt at remonstrance is useless, and it is practically impossible to avoid the annoyance if the person with the camera chooses to persist.

Now while the use of such cameras has been found most convenient for many purposes, and their proper employment has permitted many street scenes and charming bits of grouping and landscape to be secured which would have otherwise been lost, yet there is manifestly a limit to their indiscriminate use, which must be well considered if their users are to expect to retain the friendship and recognition to which they are otherwise entitled.

There are some things which a well-bred man instinctively feels and knows are due to his social position, and of which it would be an insult to remind him, and there is no good reason why the same code should not apply in matters photographic. A man who would look over your shoulder to read the open letter in your hand, or who would apply his ear to your keyhole to listen, or still worse, would repeat with glee to his friends the results of his eaves-dropping, would soon find himself tabooed from decent society, and if detected in any such performances would promptly be kicked down stairs, as he deserved.

The same man, however, will use his unobtrusive camera to perpetuate occasions which he knows full well may be a source of annoyance and mortification to his friends, or those whose friendship he would retain, and yet not feel that he has in any way forfeited his title and right to the grand old name of gentleman.

It is not easy to see wherein the difference lies, between the two actions, and, indeed, if there be any difference, the discourtesy, to call it by no stronger name, is far greater on the part of the photographer, for his results remain long after the spoken word may be forgotten and dismissed.

Of course this abuse of privilege and power only needs to be fully and widely recognized and appreciated to provide its own remedy, and in the language of a form of notice formerly seen in some public places, "gentlemen will, and *others* must refrain." All that is necessary is for every thoughtful man, and particularly every man interested in photography and its advance, to set his face firmly against this nuisance, and to speak his mind plainly and in unmistakable language upon the subject whenever occasion offers.

Henry Harrison Suplee.

KODAK STRIPPING.

Have you got a Kodak? If so, the following, we hope, will interest you. We have got one and like it. We like the compactness and simplicity of this little camera, we like to have a hundred exposures at our command with the trouble only of turning a key, pulling a string, pressing a button; and, above all, we like to be ready to shoot at any emergency, and we think great credit is due to Mr. Eastman for furnishing us with this beautiful little apparatus.

Having taken a couple of dozen pictures, we repaired to the dark-room and proceeded at once to the development. We prepared a hydrochinon developer which our experience with dry plates has taught us to be superior to iron or pyro. The usual objection against hydrochinon, that it works too slow, is entirely removed by using caustic potash as an accelerator. The pictures came out beautifully, and everything went well till the negatives were placed in the fixing solution. Then the fun began. The film commenced to frill round the edges although the solutions were quite cool. In washing the negatives after fixing, the frilling increased alarmingly, and at last some of the films detached themselves entirely from the paper and were found swimming in the water. In our distress we sought for advice in the Kodak Manual, but found none; when a similar occurrence, on a former occasion, with a valuable dry-plate negative, suggested a remedy, which was tried at once. It consisted in placing the detached film in a tray with water, and sliding a clean glass plate under it. By slightly rocking the glass plate in the water the film spread itself upon it, and the two were easily lifted out together. As the film did not stick to the glass, any wrinkles could be straightened out by moving it with the fingers; and then the plate was placed on the rack for drying.

Having succeeded so well in the first attempt, we proceeded with the others in a similar way, with equal success. A few of the films that still partly adhered to the paper were easily pulled off and secured. In all cases we took care to place the film on the glass left-handed, to insure right-handed printing. In looking over the plates we were very much surprised to find that the films had expanded considerably, some of them from two and a half inches diameter to three and a half inches without in any case distorting the picture. This expansion, however, was accompanied by a corresponding decrease in density. Subsequent intensification completely remedied this defect.

These glass-plate negatives were satisfactory in every respect, differing in no way from the ordinary dry-plate negative. By adding an alum bath after fixing, the films were found to become much tougher, and expansion to be in a great measure prevented. So far we were satisfied with our results, but our ambition was to finish the negatives in the same beautiful way as the Eastman Co. We coated some glass-plates with rubber and collodion, developed some negatives with pyro, closely adhering to the Kodak manual rules, fixed without alum, washed very carefully, and succeeded in squeegeeing a few of them on the prepared plates, without much frilling. But when we attempted to loosen the paper from the film in hot water, we found great difficulty in preventing the film from coming off with the paper. We tried with and without alum bath. Finding the process too complicated and uncertain, and yet wishing to produce the flexible negatives, we decided to adopt the following plan, which so far has given nothing but encouraging results.

We coat a clean glass-plate with rubber solution, develop the picture with any developer, preferably hydrochinon, fix, wash and place in an alum bath, in which the films are pulled off from the paper, care being taken not to strip the soluble gelatine with it. No hot water is made use of. After washing, the films are floated onto the rubber-coated glass-plate, in the manner already described, but this time right-handed, and allowed to dry. If necessary the picture may now be intensified. From that point we follow the rules of the Kodak manual, by placing the plate in the alcoholic soaking solution and sliding a gelatine skin over the film, squeegeeing into contact in the solution, and allowing to dry. When thoroughly dry, the skin is cut to the required size and the negative easily peeled off the glass.

In conclusion we would say, we are aware that the Eastman process, in experienced hands, yields beautiful negatives, but we do think that the average amateur will find it rather difficult to follow, while he will be able to finish his own Kodak negatives, without too much trouble, in the manner herein indicated.

The amateur, we take it, does not as a rule cherish the idea of simply taking a picture and leave the developement to somebody else. He will want to do this, the most interesting part of the black art, himself, and if these few lines will be the means of overcoming some of the existing prejudice against the difficulties of Kodak stripping, we shall feel pleased.

Hermann Lemp.
Einar Rasmussen.

IRIDESCENT POSITIVES IN BRONZE.

At the outset I must disclaim any and all claims to originality in the process; I make no claims to original research in photography. I am but an experimenter with other men's ideas, which I am far from seeking to claim as my own. The inventor of the process which I propose to describe is M. Geymet, who is well known as an indefatigable experimenter. Many of his ideas, I think, should be taken *cum grano salis.* But I have experimented sufficiently with the present process to demonstrate its possibility. But, like all the powder processes, it is attended with more or less of difficulty in unaccustomed hands.

There is much that is strange in this process. In all other photographic methods, it is necessary to prepare and develop the plate in the seclusion of the dark room. With this process, this precaution is not necessary. The plates can be prepared, placed in the printing frame, and developed in full daylight.

While the process may not admit of a very wide range of application, it is interesting in itself and is capable of producing some charming results.

With this by way of explanation, defence and introduction, I come to my subject.

The Sensitive Compound.

Distilled water	3½ ounces
Gum Arabic (powdered)	75 grains
Glucose (sat. sol.)	1 dram
Bichromate of ammonia (sat. sol.)	3 drams

The solution is to be filtered three times through paper, and it should be aged by exposure to light for some hours before it is used.

Coating the Plates.—This may be done in daylight. The glass, which should be French plate, is carefully cleaned and polished, and dipped in clean water just before coating. This facilitates the spread of the liquid, which does not take kindly to the glass. The glass is flowed two or three times, to secure an even coat, the excess being poured into a second bottle surmounted by a filter. If air bells form, they can be removed by blowing on the surface of the plate. The plates are stood up against the wall on a thick sheet of blotting-paper to dry, coated side in.

The Exposure.—This is made under a negative in a printing frame placed in strong sunlight. The exposure must be full in order to give good results. In general five minutes will suffice, but no harm will result from an exposure three times as long.

The Negatives.—For the reproduction of line subjects the negatives must be very dense with great clearness in the lines. For half-tone work the density need not be so strong, but the negatives must be well modeled.

For iridescent positives the negatives need not be reversed, since the positives are varnished on the back with an opaque varnish.

Development.—This can be done in daylight. It is effected by passing a tuft of cotton charged with bronze powder lightly over the surface of the glass. If the powder does not adhere, the plate is breathed upon until it has absorbed sufficient moisture for the lines of the image to take the powder. As soon as the image is fully developed, the surface is brushed over with a second tuft of cotton, using considerable pressure to impart brilliancy to the metal. Of course, an insufficiently exposed positive will not develop well; all parts of it will take the powder.

Collodionizing.—Immediately after the development, the positive is flowed with a plain collodion. The following formula is recommended:

Ether	16 drams
Alcohol	10 drams
Gun-cotton	15 grains

As soon as the collodion is dry the positive is washed in running water to remove the yellow color; it is then blotted off with blotting-paper and dried by gentle heat.

Varnishing.—In order to bring out the image with great brilliancy, the back of the plate must be varnished with a black or colored varnish. The following is a good formula:

Printer's ink (any color)	3¼ ounces
Turpentine	1⅝ ounces
Siccatif	2 drams

The Bronze Powder.—Almost all the bronze powders can be employed in this process, on the condition that they are not too fine. The No. 1 of the kind called "Brocart" is the best to use. Some of the powders will be found too dry to work well; they must of course be avoided. I have had good results with nearly all the bronzes sold by dealers in artist's goods by selecting the coarser varieties.

Producing the Iridescent Effect.—If the method above described is followed, the prints will simply show the natural color of the powders. In order to produce the iridescent effect, it is necessary to collodionize with the following collodion:

Alcohol	7 drams
Ether	18 drams
Gun-cotton	5 grains

The positive is washed as before, blotted off, and dried spontaneously in a current of air. The colors show as the plate dries, and the more rapid the drying, the more brilliant the play of colors.

The following principles must be observed in order to produce the best results:

The collodion must be weak in cotton and prepared with a large excess of ether.

The powder used in development must be coarse.

The plate must be washed as soon as the collodion has set.

The plates must be dried without heat and as rapidly as possible in a current of air.

If these conditions are observed, I am sure that no great difficulty will be found in working a process which certainly has novelty to recommend it, and which I have described in its main outlines, with the hope that it may prove interesting to some of the readers of the ANNUAL, which has scored so signal a success.

W. H. Burbank.

"A MERRY TALE."

"THREE LITTLE MAIDS FROM SCHOOL" have met in secret conclave beside an arbor, to rehearse the incidents of the yesterday. Something very funny must have happened to one of them, who delights in telling of it to the great delight of her companions.

The pleasing and artistic genre was composed and photographed by F. Gutekunst, Esq., of Philadelphia, and printed upon a steam power press from a gelatine cliché by his inimitable Phototype or Lichtdruck process.

A MERRY TALE.

F. GUTEKUNST, 712 ARCH ST., PHILADELPHIA.

DARK-ROOMS.

THERE is not such a great contrast between the simple, improvised home "contrivance" and the specially fitted up dark-room of the "society," as need dishearten or deter the amateur photographer; the difference is in degree and not in kind. As good negatives have been produced in the one as in the other. There is, however, one element that must be preserved in the most rudimentary dark-room, and that is ventilation. With this one great need provided for, almost any room or closet may be utilized in the ordinary dwelling by the least effort and ingenuity. A bath-room, *par excellence*, comes first, and can be adapted to every need of the photographer without interfering in any way with its ordinary uses. Running water is here the great boon, but even the absence of water, in using any other room or closet is not a great calamity, and can be gotten over by the exercise of a little more trouble. It is my purpose to describe some simple methods of getting up a dark-room, taken from actual experience, either of myself or of friends whom I have assisted, with such hints and suggestions as I thought might prove helpful.

In a country house, where the only supply of water was oping was a linen closet in the attic—selected because well from a well outside, and the most available nook for devel- shelved, and offering plenty of room for the storage of plates, chemicals, and the usual *impedimenta*—a dark-room was made that filled its purpose admirably. A clearance was made at one end to give working space, and a table was formed by a board fitted between the side walls. At one end the board was sawn out and an ordinary square-sided tin pan about 12 x 16 inches, and five inches deep (a baking pan) fitted under the opening. A hole was bored at one end and a small funnel inserted with a rubber cork for stopper. This made a fairly good sink, with a pail under to receive the waste water. On a shelf above was placed an old stone filter which had the usual small faucet. This was filled in advance of an evening's developing with a few pails of water from the well. The closet door was taken off its hinges, four inches sawed off the top, and rehung. A shelf projecting three inches over the head of the door-trim was hung with a valance of black cloth about eight inches deep. Half-a-dozen one-inch augur holes were bored through the partition at the opposite end of the table or board, where the ruby lamp stood, into an adjoining room and protected by another small valance of cloth. With the windows that lighted this adjoining room and the hall opened, ventilation was secured, and with the sink, the water supply, the shelving and an extra pail for the plates to soak in after the hypo bath, this dark-room was used with great comfort, and many beautiful negatives came from it.

It might be well to accentuate here the extreme luxury to be derived from adjusting the height of the developing table to its user, so that the plate may be watched in development by one standing in an almost upright condition, or, in other words, without stooping. This principally applies where room is limited; where the room is ample and everything well within reach, I put the table at such a height that the plate may be watched in a *sitting* position and without being obliged to lean over it. By observing this one point nearly all fatigue is eliminated from developing.

In another country house the study adjoined the dining-room. Here we cut an opening in the wall between the study and a closet on the other side containing a pantry sink. In this opening was fitted a light of ruby glass and an ordinary kerosene lamp placed behind it in the closet. Here one great object was attained, the getting rid of the heat and of the lamp altogether.

In the study under the ruby glass was placed a table with a lid hinged to open against the end of the room, and which when down concealed the developing sink, the waste being connected below through the wall to the waste of the pantry basin. Rubber tubing, with a faucet on the end led from the pantry supply cock to the developing sink, held there in place by a screw-eye, and adjusted only when developing. Under the table were shelves concealed by Japanese cretonne. When not in use there was not a hint of anything to disturb the usual appearance of the room, a picture hanging over the ruby glass. In this case the study was only used for developing at night.

Living once for a short time in a suite of rooms in an apartment house of which one was lighted by a doorway from a larger connecting room at one end, and by a window into a light shaft at the other with a washstand under it, I was able in the very simplest manner to work comfortably and safely. I hung a heavy portière over the doorway weighted with shot at the bottom to keep it in place, stretched "ruby fabric" over the fanlight of the doorway and the window to the light shaft, set a drawing-board on a trunk stood on end beside the washstand, and developed there an entire summer's product of negatives. During the day the portière was looped back, the trunk and drawing-board stowed away, and the ruby stuff over the fanlight and window seemed but a rosy bit of decoration.

I fitted up a bath-room once that was an ideal dark-room, even though it was very narrow. It had a window, fortunately small, and in front of it I fitted a hinged ruby sash. Between the two I led a branch from the gas bracket in the room by tubing, and having a key *outside* the ruby sash. Under the sash I hinged a broad shelf with a bracket pivoted to open out and support it when up. In the bath-tub I stood a high stool which held the washing-tray and to which was led a length of tubing from the bath-faucet and through this I let the water run continuously, for I thus made the washing of my negatives between each period of development take care of itself while developing successive plates. The heat of the gas behind the ruby sash I got rid of by opening the outer sash, little or more according to the weather, and the outside key enabled me to commence the development of extra rapid plates in a very dim light and increase it as development proceeded and became more safe. When the bath-room was restored to its normal use, the inner sash was thrown back against the side wall, the shelf let down, the tubing released from gas and water connections, and the stool lifted out of the tub.

With these illustrations of what a little ingenuity may accomplish under diverse circumstances and surroundings, I can only say to encourage others, that as perfect negatives were produced in these extemporized dark-rooms as in the more elaborate and perfectly fitted special ones I have also enjoyed, and with a wonderful degree of comfort and ease in working. The want of a special dark-room need never be a barrier to the amateur photographer, who, though he works infrequently,is ever encouraged by the thought of the accessibility of his occasional dark-room that needs so little preparation and demands no sacrifice of room or space.

H. Edwards-Ficken.

ABOUT TONING AND CHLORIDE OF GOLD.

The following will, I hope, be of service to workers in photography:

Lately, in printing with silver paper, gold and paper being in the most excellent condition; after washing, salting (to redden) and toning very satisfactorily, on immersing in the fixing bath, consisting of

Hypo	1 ounce.
Water	8 ounces.

the prints blistered very badly. It was in summer time. The water and fixing-bath were of the same temperature. It seemed to me that the paper was at fault. After fixing and removal to the usual salt water they seemed to blister still more. After washing and drying, the mounted and unmounted prints were spotted where the blisters had been. It was evident that some part of the process did not suit the paper, and not believing that the manufacturers would alter their mode of making albumen paper I did not complain to the parties who sold me the paper, but went to work to ascertain what caused the trouble. Looking over the circular that came with the paper I found a recommendation to place the prints after reddening, either with salt or acid water, in water containing sal soda and to soak them some time before toning. This I did; blistering did not occur in the hypo or the subsequent salt water bath, and the prints looked well before drying, but after drying they were a slaty-looking lot. Evidently they were over-toned. I tried less toning, but the result was the same. Then I tried my own way again; the prints blistered in the hypo, but, apart from that defect, were excellent. I really thought then I would have to send back the paper and complain to Messrs. X & X, asking them to inform the makers of the paper that they were having *many complaints* about it, but I tried again, silver, gold and paper being the same. After reddening and toning the prints were placed in water, one gallon containing five ounces of stock sal soda. The stock solution contained one pound to the gallon. They remained there some time and were then put in a solution made up of hypo, eight ounces, water, sixty-four ounces, and five ounces of the stock solution. After fixing I removed them again to the water they were taken from before they were put into the fixing bath, and without further treatment let water run into the dish, and washed the prints. Result, not a blister; toning and surface excellent. The sal soda softens both the albumen and the sizing of the paper; and so I would caution all photographers who may try the above, that, should the albumen move under their fingers so that it leaves marks, it shows that the silver bath is too weak, or the paper has been insufficiently silvered. Knowing the cause it is easy to apply the remedy.

Now let us say something about the quality of the gold used for toning. Many photographers whom I have met say that their own make of chloride of gold is far better than any they can buy, and that in fifteen grains of the commercial chloride of gold there is only about half gold, and the other half is sodium. That is a great mistake. The fact is that the commercial chloride of gold—the kind that is sold in ground stopper bottles, and is of a brown color—is really too pure for toning. For gilding Daguerreotypes it is absolutely necessary to use chloride of gold in its utmost purity, but for toning albumen or plain prints the removal of the copper alloy takes away from the chloride of gold its most valuable toning properties. When copper is left in the solution of gold it is much better for toning and the same weight of unpurified chloride of gold will tone more sheets of paper than the same weight of pure gold. The value of the home-made article is due to the fact that photographers never remove the copper in making chloride of gold from coin. The proper name of the chemical should be chloride of gold and copper. On adding the latter to water and neutralizing it by the addition of bi-carbonate of soda a slight greenish precipitate occurs, which will again redissolve by stirring the solution. The green precipitate proves the presence of copper. With the commercial article the solution will not turn green by the addition of bi-carbonate of soda. The addition of copper to the gold toning bath has proved to be of great advantage, notwithstanding what has been said to the contrary.

If my advice to my brother photographers to use the unpurified gold for toning should lessen their troubles, it will afford much pleasure to a tolerably old hand at picture-making.

William Bell.

PHOTOGRAPHING BATS.

In the early dusk of summer evenings, and until darkness finally hides their flight, bats in countless numbers issue from the mouth of Howe's Cave, Schoharie County, N. Y., and flutter about in erratic pursuit of the smaller members of the myriad winged carnivora, that presumably are themselves not less on gore intent, and live their brief life seemingly but to devour and to be devoured. Catch one of these uncanny creatures of darkness, and he protests against it with his penetrating voice, which is almost a hiss, and said to be the shrillest sound measurable by the human ear. Grasp him, and he shows a formidable set of teeth, but his bravado is only the hysterical timidity of a bird, and his struggles are but for freedom. Once quieted, he lies as still as a young sparrow, and is as capable of attachment. He has been known even to evince affection for the hand that fondles and feeds him. His eyes are black and bright as beads of jet, and look knowingly from his softly shaggy head. His fur is long and soft as down on the thistle, and his spread wings are like daintiest satin and so transparent that the blood can be seen throbbing through the minute channels.

The bats of Howe's Cave are not ordinary bats. I am not naturalist enough to tell wherein they differ from other bats, but that they do is certain, for they have been the subject of special study by learned professors who revel in vermin generally, and cut up bugs and things to see how they are made; they hook on to the rocks by their hind feet and hang with their heads downward in a way common to all bats, and no amount of argument can make them understand the risk they run of apoplexy by so doing. Where the swarms which emerge from the cave hide themselves no one knows, nor has anyone ever found a bat's nest there, or a young bat even. They burst upon the visited portions of the cave full-grown and in droves. That their dead are never found, must be accounted for on the ground of cannibalism; they have the house all to themselves; they are its only living inhabitants.

In winter but few are seen. Nature has provided that at this season their wants, like those of the hibernating bear, are few. This is fortunate for them, for even in the latitude where the cave is situated, flies are also scarce at this season of the year. This winter torpidity is evidently not because of the cold simply, for the temperature of the cave varies only about four degrees between summer and winter; it is only another one of the mysteries of which this every-day world is full. Occasionally, however, individual bats are seen hanging to the walls of the cave, not particularly lively. When blinded by the torchlight they are easily captured. Dislodge them, and they drop helpless for the second; when a hat promptly clapped over them makes them prisoners. Then all you have to do is to slip your hand under the hat and there you have them.

A lady living at the entrance to the cave is authority for the statement that bats wont bite. She handles them herself with impunity in proof of the fact; but the funny part about it is that no table is too high for her to get on top of, if a poor little scared mouse happens to skitter through the room where she is. I had full confidence myself in the lady's theory, and so instructed my guides when we made some captures of this kind last winter, but I noticed that they, although "to the manner born," preferred to secure the little squeaking wretches with a couple of sticks—even after I had assured them that they would not bite.

I proposed to photograph some of these bats hanging to the walls of the cave, but the places they selected when they wanted to hang themselves up were not favorable to study, or easy of access to "the man with the tripod," so I gathered a few, and bunching them in a cigar box, left them out-doors to cool off. As the time was January, the treatment had the desired effect, and when after a time I looked at them they appeared docile enough, except for their impish little eyes. Preparatory to "posing," them I took a half hitch around their hind legs with a fine silk-covered wire to string them up, but when I placed them against the rough surface of the rock, to my surprise they attached themselves to it firmly enough to support their own weight; so I removed the wire, and hung them naturally with their heads down, as I had seen them hang before their capture. I had some difficulty in freeing one tiny foot from the wire, and laid a little bat on my knee to be the better able to pick the hard knot. His bright eyes seemed to enquire my object, and he raised his head half-way toward the entangled foot once or twice as if in mild protest, then straightened out lazily again, stretched a cold little claw no larger than that of a humming bird, over to take hold of my fingers, then settled down to rest again, as if perfectly content with his position.

Before hanging my subjects on the rock, I had placed my camera in position, and focused on a lighted match held there, bringing the lens to about the same distance from the rock, that the ground glass was back of the lens, that I might make the objects appear life size. When all was ready I ignited about one-fourth of an ounce of flash powder close to the side of the camera, and to make more certain of success exposed a second plate in like manner. Between the first and second flash my lazy little bat took occasion to let go his grip and drop to the ground, and when I put him in position for the second trial he discovered that I had hung him wrong end up, so he changed ends and started on a tour of investigation. As the flash was not absolutely instantaneous (I have yet to find a powder that can be truthfully called so) one wing that was opening at the time, shows evidence of motion. After meditating a minute or so he plumped down on the earth again, and after two or three spasmodic efforts flew away for good. Then, one after another, his companions, warmed by the temperate air into life again, spread their noiseless wings and fluttered away into the darkness, to tell, perhaps, to their wondering fellows how a horrible creature had laid violent hands on them while they napped, had frozen them into the semblance of their last sleep, bound them in cables of copper, and, finally, nearly blinded them with the fearful sunlight that afterwards flashed out at intervals all along through the dim aisles of their once peaceful homes, and nearly suffocated them with the dense clouds of sulphorous smoke it left behind.

S. R. Stoddard.

THE STORING OF NEGATIVES.

In the practice of photography there are so many incidental things which tax the time, that whatever contributes to convenience and dispatch, is worth adopting. To save and store one's negatives involves some trouble no matter what method is employed, but it seems to me that the following plan is the most simple and convenient of any, for amateur or professional:

Write the name and number of the sitter upon the negative and slip it into a stout manilla envelope, upon which also write the name and number. Ten negatives in envelopes will easily go into a plate box, such as the manufacturers use to send out plates in. The smaller of the three parts of the box may be dispensed with to allow the negatives in the envelopes to go in easily; and then we have just a box with its cover. But these boxes must go somewhere, and a convenient way to dispose of them is to have boxes made of common boards that will hold just a dozen pasteboard boxes, and setting the box upon its side on the floor against the wall, shove in the plate boxes standing edgewise; the end bearing the number of the box coming to the front. It is well to have the inside of the wooden box a trifle longer than the thickness of twelve plate boxes, so that they can be gotten hold of easily when you wish to draw one out. The size of the box mentioned is convenient for the reason that if at any time one wishes, or needs, to move a portion of what have accumulated to another part of the building it can be carried without removing the plate boxes, and they are properly disposed of when they are set down. One box can rest upon another until the ceiling is reached if desired. The name of the sitter in the register only requires to have the

number of the box against it. When a negative is wanted the number on the box is much more easily found than the number which marks its place in a rack. To look over the ten plates that the box holds is the work of a moment, as the name on the envelope informs at once.

This method has the advantage of keeping the plates excluded from light, which my experience with gelatine plates has proven to be necessary. Also a larger number can be stored in the same space than in any other way; and, what is of some account, they are entirely free from dust when wanted for use. I think, besides, that it is a saving of cost as well as trouble.

G. L. Hurd.

CONCERNING BROMIDE PRINTS.

The importance of sticking to the good old stand-by of ferrous oxalate development for bromide prints, especially when the more rapid Eureka papers are used, and of employing a well acidulated solution of potassium oxalate in preparing the developing solution, has by this time been, I suppose, brought home by experience to most minds, but I doubt if the extent to which acidulation may be profitably carried has been generally comprehended. The high priests of the inner arcanum know it, but how about the great congregation of worshippers in the dim religious light of the ruby lantern? To such I venture to give a novel formula, which in my hands has afforded pleasing results, and which admits of a wide range of resultant color, from pale grays and velvety blacks to warm sepia browns.

The solution of potassium oxalate should be very near the saturation point. To accomplish this, one pound of a trustworthy potassium oxalate, such as is sold expressly for the platinotype process and the neutrality of which is assured, should be dissolved in not more than three druggists' pints of hot water, or forty-eight fluid-ounces. When cold (and this point of coolness is important) the solution is to be acidulated with oxalic acid, employing for this purpose a solution of 100 grains of the acid in one fluid-ounce of boiling water, adding half of it boldly and the rest slowly, testing with fresh blue litmus paper until the reddish change is distinctly visible by daylight, and not resting content with less than the plain appearance of bright red specks in the paper. Generally the entire 100 grains of oxalic acid are required to effect this, and, sometimes, with potassium oxalate of doubtful neutrality, much more. Never neutralize or acidulate a solution, by the litmus test, at night; for the yellow light of an ordinary lamp or gas light gives uncertain color values.

Now for the iron solution. Take an eight-ounce bottle, well cleaned, and put in it the following:

Protosulphate of iron	960 grains (2 oz. Troy)
Citric acid	100 grains
Bromide of potassium	80 grains
Add distilled water to make up	8 fluid ounces

Shake well, lay the bottle on its side (with the cork in, of course), in a warm place, and the crystals will all dissolve in an hour, giving a pale green solution, perfectly clear and needing no filtration.

The especial beauty of this formula is its singular keeping quality. I have used some from a nearly empty bottle, that had been made up eight months before, and yet showed no signs of muddiness. Neither does the made-up developer became turbid, but it remains clear and pale, even after repeated use, and does not stain the fingers to anything like the extent that the ordinary neutral ferrous solutions do. It can be used to develop five or six prints in succession, and then can do duty as "old developer" for six months more.

For use, to get gray prints, take two drams of the iron solution to one fluid-ounce of potassium oxalate, and give rather short exposure. For dense black prints, give one or two seconds' more exposure and add half an ounce of water to the mixed developer. To get the warm sepia tones which we all so much admire, the first essential is a perfect negative, full-timed and strong, without chalky contrasts, and the second is about fifty per cent. longer exposure in the printing frame, adding three-quarters of an ounce or even one ounce of water to the potassium oxalate solution. Only the ordinary Eastman paper can be depended on to give warm tints, but the transferotype paper will do pretty well. The Morgan & Kidd, Alpha and other bromide papers have an insurmountable proclivity to grayness.

This formula works well with gelatino-chloride plates in making transparencies or lantern slides.

Another wrinkle may not be amiss. It often happens, especially with slightly over-exposed bromide prints or lantern slides, that the developed positive or slide is good in detail but thin and of a poorish brown color. In such case, it can be intensified by bleaching out with the standard mercuric bi-chloride (corrosive sublimate) formula, washing well in a twenty-grain-to-the-ounce solution of ammonium chloride to clear the whites, and, after a generous washing in running water, redeveloping to a rich purple-brown tone by means of cyanide of silver. But this same cyanide of silver must be prepared with care, by dissolving 100 grains of silver nitrate in ten ounces of distilled water in one vessel, and in another, say 200 grains of potassium cyanide in two ounces of hot distilled water. Then add the cyanide to the silver, slowly, until the dense white precipitate is almost, but not quite re-dissolved, and make up with water to sixteen fluid ounces. There must be a noticeable precipitate left in the bottom of the bottle, to ensure complete neutrality.

Another kink is to use oxalic acid, about 100 grains to the quart, for the clearing solution in which plates and slides should alike be thoroughly bathed twice or thrice after development and before putting into the hypo bath. I prefer it to acetic acid, but it is more bothersome.

A. A. Adee.

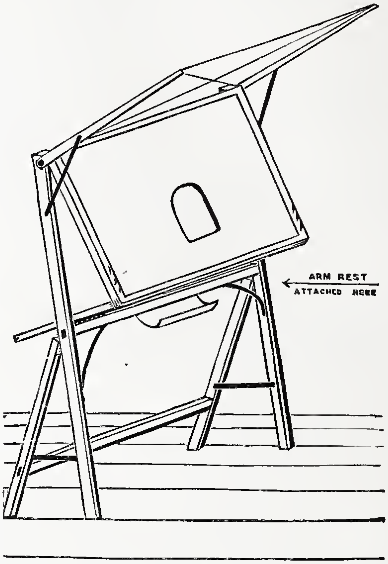
A RETOUCHING EASEL.

As it is frequently necessary to do negative retouching in the operating-room or perchance the waiting-room, it is desirable to have a table, a stand, or an easel for the purpose, which is both convenient and becoming—if not ornamental. The easel here described is capable of various adjustments, and is at once light, easily moved about, and steady, and may be folded flat for transportation or storage. It is easily constructed at small cost by anyone who is " handy with tools."

This one was made of cherry, which is best suited to the purpose, being close-grained, soft, and not splitting easily; maple, ash, oak or black walnut may be used, but cherry is preferable. It will be convenient to get wood sawed in strips $1\frac{1}{4}$ x $1\frac{1}{2}$. The iron braces are made from $\frac{1}{4}$ inch round iron, and $\frac{3}{4}$ inch band iron. The services of a blacksmith are not absolutely required if one has a lathe with which to drill the holes. Two pairs of hinges, "back flaps," 1 x 3 are required, and one pair of brass hinges, 1 x $1\frac{1}{2}$.

The wing upon which the negative is worked is supported at any angle by a frame hinged to its lower side, and having a ratchet at each side which catches upon the crossbar of the easel. This frame has a sheet of white cardboard tacked over its upper side to serve as a reflecting background.

The opening over which the negative is laid is cut exactly cabinet size with arch top and rounded corners; a piece of finely ground glass or a celluloid film, from which the coating has been carefully cleaned, covers the opening behind, being held in place by leather tacked across the corners, or by tacks.



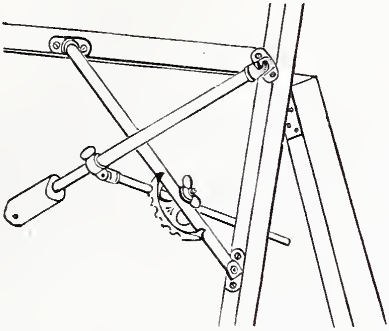
Retouching Easel.—To Fold.

The negative rests upon a thin strip which is held at the desired height by a series of square brass hooks screwed into the wing at the sides. An additional convenience in the way of a turn-table placed upon the wing for holding the negative is suggested, but the details have not been worked out as yet. For the convenience of the operator a small shelf or catch-all for pencils, brushes, scrapers, etc., is attached to the cross-bar below the wing.

The cut gives a very good idea of the easel without the canopy, which is simply a piece of opaque cloth thrown over the whole. This cloth is large enough to form a short curtain behind the operator when seated at work, so as to shut out reflections and relieve the eyes. The cloth may be tacked to the top and sides of the frame.

Considerable study was given with a view to constructing a simple but complete article, and as the result every useless piece was discarded, and such a combination of parts was made as to secure strength with lightness and adaptability.

No retouching stand can be considered complete without an arm-rest; the one attached to this easel is perfectly adjustable to any position, and can be changed by loosening one thumb-screw.



Arm-Rest For Retouching Easel.

Experience proves that tools and appliances properly adapted to the purpose contribute in no small degree to the excellence of the work done. Although an old soap-box on a barrel may do, yet it is better policy to seat the retoucher before a neat and convenient easel.

C. D. Cheney.

HYDROMETER VERSUS BALANCE.

It has been contended that developers and solutions can be mixed more easily and correctly by using solutions of the salts of a given specific gravity instead of weighing the ingredients and dissolving them in sufficient water to make solutions of specified volume.

Experiments were made which proved that it was more tedious to make solutions of a given specific gravity, without additional use of scales, than to compound them by weighing.

The hydrometer generally used by photographers for this purpose is the actinometer, a hydrometer so graduated, that each degree indicates the grains of nitrate of silver in an ounce of water. The scale reads from 0 deg. to 80 deg., and the following table gives the corresponding specific gravity:

Degrees Actinometer.	Specific Gravity.
0	1.000
10	1.019
20	1.031
30	1.055
40	1.072
50	1.092
60	1.108
70	1.126
80	1.144

It is usual to make these solutions of salts of such strength, that they show 60 deg. actinometer. But with actinometers, as usually obtainable, their indications can scarcely, even with great care, be read to 1 deg. This, with crystalized carbonate of soda, would give an error of about 4½ per cent., with carbonate of potash a slightly greater, with sulphite of soda a somewhat smaller error. The claim, therefore, of greater accuracy in compounding developers by means of the hydrometer, can scarcely be substantiated.

It seems scarcely possible that an easier plan can be devised in making solutions, than to weigh the substance, dissolve it in a slightly less quantity of the fluid than called for by the formula, and then add sufficient fluid to make up to the volume required. No difficulty will be encountered if only such terms are used in the formula as are generally accepted and cannot be mistaken, viz.: either grains and fluid ounces (and the fractions of the latter; fluid drams and minims), or grams and centimeters. In weights the terms, drams, ounces, pounds, and in measures, pints, quarts, and gallons, should be discarded, as these terms, according to the various systems of weights and measures which they represent indicate under the same name quantities that differ from 9 to over 20 per cent. The grains in England and in the United States are identical. The fluid ounce in England differs in volume from that in the United States, the former being equal to 461 United States minims, while the latter is equal to 480 such minims; in other words, all English fluid measures up to the ounce are equal in volume to $\frac{96}{100}$ of the corresponding United States measures. But this difference is only about 4 per cent., about as correct, therefore, as the results obtained by the hydrometer.

I append a formula for a developer, which for quick exposures has given very rapid development. It consists of three solutions:

a.	Hydrochinon	24 grains.
	Formic acid (sp. gr: 1.16)	12 minims.
	Water to make 1 fluid ounce.	

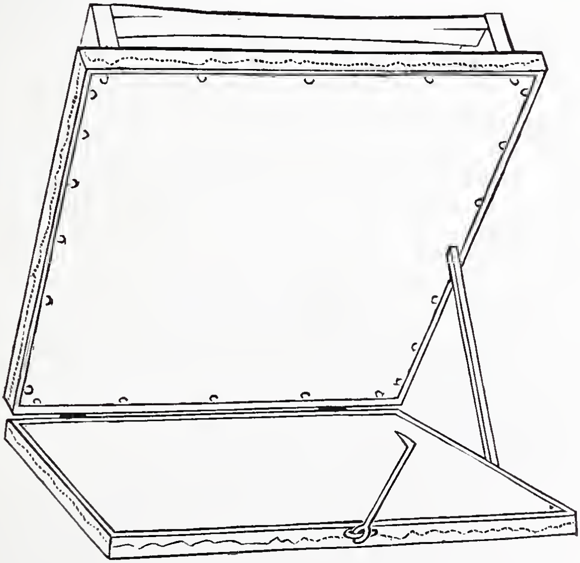
b. Sulphite of soda crystal........................120 grains.
Water to make 1 fluid ounce.
c. Caustic Soda...................................32 ounces
Water to make 1 fluid ounce.

Developer.—Of *a*, 1½ fluid drams; *b*, 20 minims; *c*, 1 fluid dram; water to make 1 ounce.

This developer keeps well and can be used for several developments. *A. Heger, M.D., U.S.A.*

BLOTTING PADS.

To make them I used two flat boards, 20 x 24, with heavy cleats to keep them flat; covered on one side with Canton flannel. They are hinged together at one end and fastened at the other end with a hook. With small tacks in the edge of the paper I fasten a sheet of blotting paper to the cover, and lay two or three sheets of blotting paper on the bottom board. The flannel and paper give good elasticity. I lay the wet sheet from the bath face down on the blotter, shut the cover down and fasten with the hook, and in this way quite a pressure is given. While I am putting another sheet of paper on the bath the first is ready to transfer to the drying room. Fifty sheets can be blotted off on a half dozen sheets of blotting paper, and they may be used over and over again until they are heavy with silver. *C. R. Arnold.*



BUCK'S MILL.

The colony at Rugby, Tennessee, which was started with great eclat, is gradually declining, but while losing in that respect it is gaining as a health resort. The "Tabard Inn" is now chiefly occupied by summer residents, attracted by the clear, dry air, and pure, purling streams of one of the finest table-lands of America. Not far from the hotel is Buck's Mill, a spot locally famous during the civil war, and now a pleasant resort for the guests of the hotel. Here the children come for their sports, and the older guests to loll under the shade.

The mill was built by Joseph Buck, about fifty years ago, on the bank of the Clear Fork river, which affords a constant motive power the greater part of the year. In the early arcadian days the patrons of the mill brought their grist, left the toll in a box, turned on the water, ground their corn, and then "shutting down," left everything in order for the next one who came.

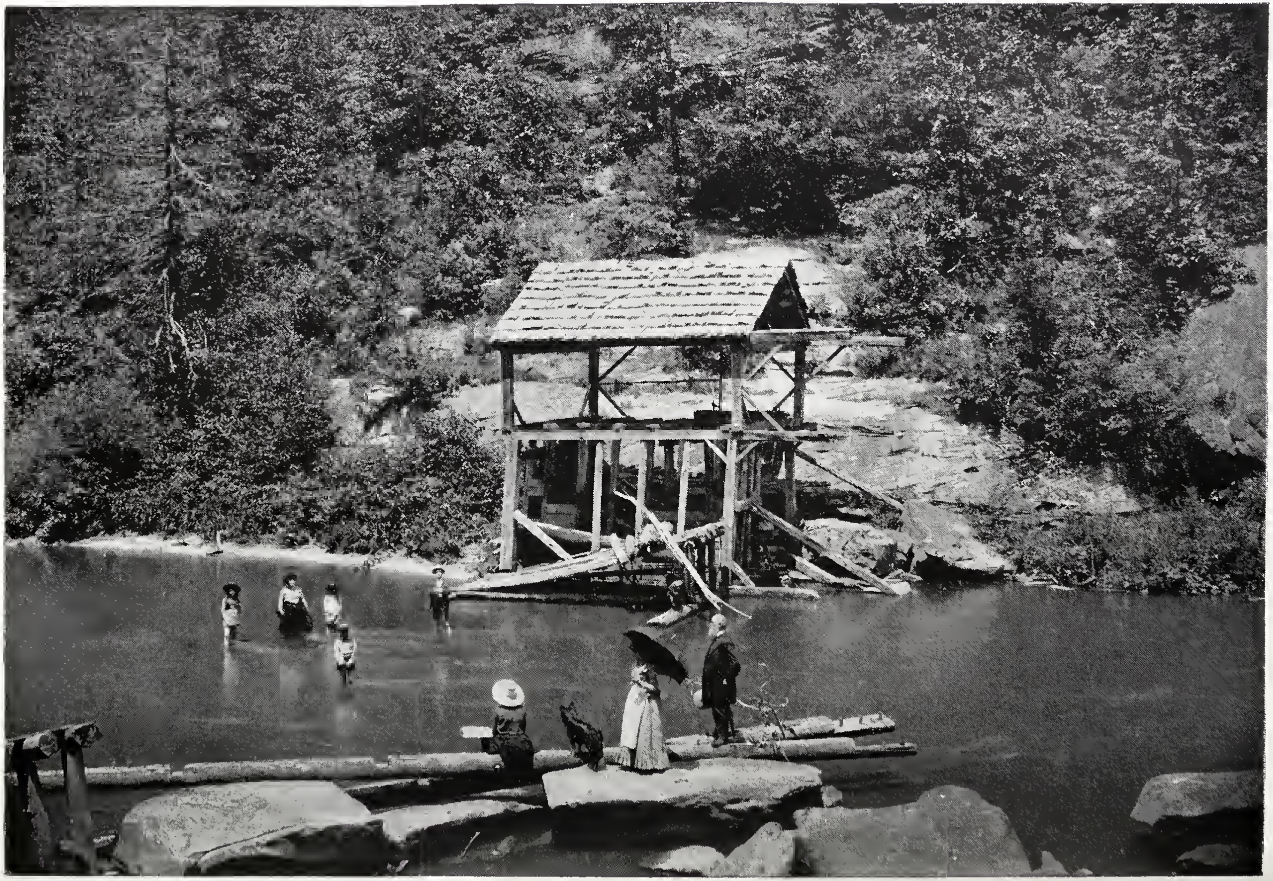
During the war this spot was a favorite camping ground of the famous raider, John Morgan. At various times soldiers of the contending armies camped there, and found the mill too useful to be destroyed. A year ago high water washed out the dam, dismantled the mill, and left it the picturesque ruin depicted by the camera.

The region about is wildly picturesque. Across the stream, beyond the mill, an unbroken forest of mountain growth stretches away for miles, and so dense it is, that even the natives are careful not to stray away from the single beaten path. From the high ground at the inn there is a magnificent view of mountain and valley, with the Blue Ridge, sixteen miles away, for the background.

The original photograph of this picturesque spot was made by Mr. Byron E. Weldy, of Dayton, Ohio. The photo-engraving was made by Mr. M. Wolfe. It is a good specimen of his fine line screen plates and half tone process of engraving.

GRADED BACKGROUNDS.

It is now many years since a graded background was introduced to the profession by the eminent artist "Kurtz." This gave a perspective and atmospheric effect to pictures which has never been surpassed. Its form was like the bowl of a funnel. It was made of various materials, but was expensive



Photographed by Byron Weldy. A RAIDER'S RESORT. M. Wolfe, Dayton, Ohio.

and clumsy in operation, and hence soon went out of the market. To produce fine effects it required a trained eye to rightly judge the values of light and shade represented in the ground, and adjust the same in harmony with the lighting of the subject. About the same time a Western man brought out a background made on a similiar principle. It was a painted circle representing on a flat surface the shading of the bowl or cone, and was mounted on a light wheel frame with a spindle in the center of the frame which might be attached to a head-rest, and thus be turned so as to bring the lights or shades to any desired point. It immediately became popular and was soon in use the world over. There are some of them still in use which are highly valued by the owners.

For some unexplained reason they were soon withdrawn from the market. These grounds were objected to because they were too small for any except bust portraits. An improved form has been made in which the size has been increased to six feet diameter, making them large enough for three-quarter length standing figures. By noticing the portraits of eminent artists it will be seen that the background is approximately darkest opposite the highest lights on the figure, with the immediate gradations of the ground between substantially representing, if the figure is removed and the ground continuous, the shading of this revolving ground. This is the principle; but there are innumerable modifications possible by the circumstances of the posing and lighting of the subject.

Suppose that you are photographing an old gentleman with white hair and dark coat. Turn the ground so that a straight line from the center of the dark side of the ground shall strike the center of the light side, this imaginary line falling at an angle of about 45 degs. and observe the effect. The figure is in wonderful relief. The white head has a dark ground to give it prominence, the dark drapery has a lighter ground for relief, while the outline of the shadow side of the face is in full relief by the intermediate gradation. By this management the complete outline stands boldly out, but because of the perspective gradations which give an appearance of atmosphere, it is soft and in harmony. By revolving the ground a half turn, the light is thrown about the head, with darker shades at the shoulders. A vignetted print from a negative taken in this position is the typical vignette usually seen in engravings. The clouding at either shoulder may be made more prominent or diminished at will, by turning the ground and by raising or lowering it. The moment the ground is placed behind the sitter a mere novice will see how to use it effectively, and in time learn the variety of effects which may be produced. *L. G. Bigelow.*

SOME MORE MINOR MATTERS.

It was my pleasant task one year ago to call the attention of the ANNUAL's readers to "some minor matters" in photographic practice. The list is a long one and is by no means exhausted. I therefore wish to speak in this issue of a few more minor matters that are, in results, of considerable importance.

In order to save gold in toning, and to avoid the risk of tearing, many printers trim their prints on taking them from the frames and just before immersing them in the toning bath. It will be found an excellent plan to trim your prints not only before toning, but even before they are put in the printing frames. Cut your paper the exact size you wish the finished photograph to be, and place it exactly over the negative, or that part of the negative, which you wish to print.

Why should we always preserve all their is on a negative simply because it is there? Often a photograph may be much improved by cutting considerable off at one side or the other or from the top or bottom. A successful artist once told me that he never decided upon the exact dimensions of his painting until it was nearly completed, but always allowed the circumstances attending the artistic growth of his picture to control him in this matter. He invariably commenced work, he said, on a canvas much larger than he expected his finished picture would be, and then changed its size and shape, during work, as his art demanded.

The shape of a picture has also a great deal to do with its effectiveness. I have seen 5 x 8 landscapes, rather below the average of artistic merit in photographs, which would have made really striking pictures if an inch had been taken off from the bottom and fully two inches from the top. Then again, an upright picture of as narrow dimensions may be most effective. Sometimes a round print will contain the best there is in a negative and present a singularly satisfactory appearance.

Some negatives of the larger sizes may contain two or three small pictures complete in themselves if printed separately from different parts of the negative, but which, when printed on one piece of paper, have little, if any, pictorial charm. Many photographs fail, not because there is not enough in them to interest, but because there is too much, and the sense of unity and completeness is thereby destroyed. This method of printing from certain parts of a negative may be especially used with advantage in making lantern slides by contact, from larger negatives. Two or three lantern slides, of different subjects but complete in themselves, may be made at one printing, from one large negative. I do not advise making large negatives for the purpose of printing more than one picture therefrom, but suggest the method as the means for using pictorially, negatives already made, which, printed in the common way, are of no pictorial value.

Then, too, why should we tone all our photographs exactly the same ? It is as if a printer used always one general color scheme. Let us tone in accordance with the subject of our photograph. A winter scene is rendered most effectively in blacks and whites ; for autumnal landscapes a brown tone is better ; spring and summer views might be more harmoniously presented in warmer and brighter tones, and these differences can all be effected by the different use of the one gold toning bath. In the toning of portrait prints there is the same (if not quite so large) room for differences in the color shade. An old face should, of course, be toned differently from a baby portrait ; yet how many professionals vary their toning ? In fact, uniformity seems the one great object to be attained in a photographic establishment.

By the use of different printing methods, a greater difference in tone and effect may be obtained, than when one kind of paper is used and reliance is placed solely upon the modifications of the gold toning bath for artistic results. Never have we had so many resources at our command to vary our prints and make the most of every negative. Leaving out, for the time, the various tones to be obtained on silvered albumen paper, we may mention bromide and platinum paper for various cold and warm tones and "broad" effects, as the artists say ; plain silvered paper for softer work and line or "sketchy" effects ; ferro-prussiate paper for blues and whites and other tones that may be obtained by special toners on this paper ; chloride and iodide paper for various delicate shades ; "Aristo" paper for rendering delicate detail and tone ; the carbon process (now so little used, but possessing so many good qualities) ; the various methods on glass ; photo-gelatine printing : and, finally, photo-gravure printing in various shades. A glance at the current issues of THE PHOTOGRAPHIC TIMES shows how much can be done in securing an artistic effect by proper selection of the color shade to be used in printing from copper-plate engravings.

My plea is for individuality in photographic work. Let us use the means at our command to modify results in accordance with the requirements of individual subjects.

W. I. Lincoln Adams.

SELECTED ENLARGEMENTS.—HOW TO MAKE THEM.

AN account of my method of enlargement may contain a useful suggestion to those who may have occasion for a similar device. Wishing to reproduce certain selected portions upon permanent bromide paper of a star chart photographed upon a 6½ x 8½ plate, I fitted a sheet of ground-glass in the groove made for the cover of a starch-box, and removed the bottom. In its place strips of wood (printers' reglets) were attached, extending beyond the sides of the box, and thin strips were screwed upon the ends of these, also extending a little above and below.

I made a separate similar frame, the horizontal strips having grooves into which I could slide a slate-frame a little larger than my negatives. The slate being removed, a negative could be placed in the grooves for holding the slate, and the slate-frame with the negative could slide in the grooves in the horizontal strips. This separate frame, carrying the negative, could be adjusted vertically upon the other, and clamped to it by clips or by clamping screws. Any desired portion of the negative might thus be brought to the center of the opening.

My camera is 17 x 17. A framework made of reglets extends far enough above the starch-box to bring the centre of the box opposite the lens when the projecting arm, three feet long, is clamped to the top of the camera. An adjustable framework similar to that described in the last paragraph holds the ground-glass and the plate-holder; except that none of the strips extend beyond the camera.

The camera is placed two or three feet from the window, and directed upwards towards the unobstructed sky. The depth of the box I find sufficient to prevent the window-sash from darkening perceptibly any portion of the plate. The projecting arm is clamped in such a position as will produce the required enlargement.

The negative is first adjusted approximately in position by its framework. I have found it convenient to attach two curtain rings to the ends of a thread, one ring being placed over the selected portion of the negative, and the other counter-balancing its weight, in order to identify the portion of the negative to be brought to the centre of the ground-glass. Of course this must be removed before the picture is taken. The accurate adjustment of the position of the ground-glass and plate holder, by its frame-work, requires but a few seconds. The accurate adjustment of the position of the negative itself would be tedious.

The focusing cloth is clamped by clips to exclude the light from around the plate-holder, and I have found no difficulty in withdrawing and returning the slide behind the focusing cloth without introducing stray light.

The main idea is the use of a large camera, permitting the adjustment of the plate-holder, instead of accurately adjusting the lateral and vertical position of the negative. The details can be adapted to individual requirements.

If the negative needs to be placed vertically, the position of one of the grooved strips can be readily changed by the removal of two screws.

Henry M. Parkhurst.

A HANDY MOUNTANT.

The following formula gives a convenient and ready method of making a thick, smooth mucilage at a minute's notice, suitable for mounting all kinds of photographic prints:

Powdered gum tragacanth	1 dram.
Powdered gum acacia (or dextrine)	1 dram.
Alcohol	3 drams.

Mix the spirit with the powdered gums in a cup, afterwards adding, gradually and with continual stirring, sufficient cold water to form a paste of a suitable consistence for the purpose required.

W. B. Allison.

NOTES ON LEIMTYPIE.

For the last two years the production of printing blocks by the process called Leimtypie has been carried on in most of the European countries. Some of the results derived from experience, during that time, I will here describe.

To print direct from a gelatine relief is practicable only at establishments where the cliché itself can be prepared. The relief is so solidly fastened to a zinc plate that it can never become detached from its support during printing, but it will, however, in the course of time (it may happen before the expiration of six months) shrink very considerably, so much so, indeed, that it will lift itself from the support, or break. To better preserve the printing plate, and make it durable for a long time, the gelatine relief should, after a few months, be taken off its support by the aid of heat, and be refastened to another zinc plate. When printing is to be done at a great distance from the photo-mechanical laboratory, it is advisable to make galvanoplastic copies of the original gelatine relief.

The resistance of the gelatine relief against friction or pressure is much greater than that of a wood-cut, and quite equal to a zinc etching. The Imperial Printing House of Vienna has taken as many as two hundred and five thousand proofs from one gelatine relief without injury to it.

If it is intended to print large editions from one plate, its being absolutely dry is the first requisite to secure success; and all the chromates used in the preparation of the sensitive film must be decomposed by a thorough exposure to light, and every trace of glycerine be oxidized by the chromates. A gelatine cliché prepared in this manner is harder than a zinc plate, and much sharper prints will be made from it.

To develop a gelatine relief takes, as I have heretofore stated, but a very short time, perhaps from one-half to two minutes; it needs only to be dried to make it printable.

An operator of average practice can develop in one day several hundred of them, and as the material used involves but trifling cost, it is fair to suppose Leimtypie is the printing method of the future, and may, in time, supersede all others now used. *J. Husnik.*

SOME LITTLE THINGS.

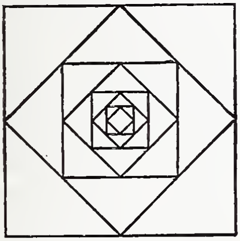
1. A LITTLE piece of almost anything under the middle of the developing tray in such a position that the tray nearly balances on it, makes rocking quite easy, in the absence of any automatic arrangement for that purpose.

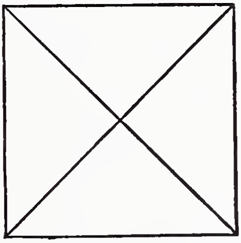
2. A little tuft of cotton wedged into the end of a small glass tube with a piece of wood, makes a handy swab to use in developing, etc., for removing air bells or local applications of restrainer or accelerator. It is quickly made, and does away with the annoyance of floating hairs dropped from camels hair brushes after they have been used for awhile.

3. A little time allowed for dry pyro to dissolve before using may save a good negative that otherwise might be covered with small black specks of over-density. The resulting print would do duty for an instantaneous view of a snow storm.

4. Many little things make interesting photographs, such as flowers, crystals, mosses, insects, etc., etc., and may be made with a short focus lens, a small stop and *plenty of time*, on the same principle as any enlarging, that is, by working with a long draw to the camera. A small stop is necessary, as it is difficult to get depth, but otherwise there is no trouble. Instead, there is much pleasure and instruction, as small objects may be enlarged ten or fifteen diameters. You may be led on thus into the practice of photo-micrography.

5. By looking at your finished prints with only one eye quite a stereoscopic effect is observed by some persons; it is not much trouble to try.





The principle involved in the accompanying diagram is very simple, but still may be made useful in many ways. To the photographer in case of need it gives a complete series of diameters for the circular openings of a set of diaphragms requiring double time for each succeeding smaller size, without regard to what particular *f*/— his largest stop may be.

In application the side of the largest square must correspond with the diameter of the largest circular opening which the particular lens in question will allow, and the side of each succeeding inscribed square will be equal to the diameter of the next smaller stop.

It is not at all necessary to have an instrument at hand to lay off this square, as it may be done by folding a firm piece of paper, in which case a still simpler application of the principle may be used, as follows:

If the side of the above square is equal to the diameter of the largest stop, then the distance from the intersection in the center to one corner will equal the next stop diameter, and from these two measures all the others may be easily found, as all alternate stops are in a ratio of two to one *in diameter*, thus, $f/_{16}=\frac{1}{2}$ of $f/_{8}$ and $f/_{32}=\frac{1}{2}$ of $f/_{16}$, etc., etc.; with the intermediate stops the same, $f/_{22.6}=\frac{1}{2}$ of $f/_{11.3}$ and $f/_{45.2}=\frac{1}{2}$ of $f/_{22.6}$, always by diameters.

These proportions will hold the same for any other than $f/_{8}$ for the initial diameter, and so will answer for any lens if this particular series of stops is wanted; of course the same results may be reached by calculation. The above is easier to use than to describe.

Theo. H. Lüders.

HYDROCHINON DEVELOPER.

In THE AMERICAN ANNUAL OF PHOTOGRAPHY for 1889, on page 126, I published two hydrochinon developing formulæ, which in my hands and those of many other practical operators, have proved to be of the highest efficiency in developing portrait negatives. In every comparative experiment made with pyrogallol and ferrous-oxalate, the hydrochinon developer has shown a decided superiority; it is productive of richer and finer tone gradations, the time of exposure is considerably reduced, and what should not be lost sight of, it is easier to handle and to work with than either of the other developers.

The two hydrochinon developers previously described are somewhat different in their composition. For the past year my study has had for its object to learn by practice for what particular kind of emulsion each of them can be most profitably employed. Plates of a tendency to hardness result in better details and half-tones when developed by the Kleffel formula, while others having a tendency to produce feeble and weak negatives, are better developed by the Obernetter formula, which is of higher concentration, more powerful in its action and yields very harmonious effects. The veil deposited on the non-exposed parts of the plate (mentioned in my last year's article) does not result from hydrochinon; its cause must be looked for in the emulsion and the mode for preparing it. An ammonia oxide of silver emulsion, forced to the highest grade of sensitiveness, nearly to the point, perhaps, where fog must occur; or any other emulsion that has been dried at a higher temperature than 14 or 15 degs. R.=62 to 65 degs. F., will invariably show this veil. Emulsions of medium sensitiveness, or where any possible excess of ammonia has been neutralized with acid, are free from it.

Let me mention here, incidentally, the high importance of a thoroughly purified gelatine in emulsion making. In my researches to find the cause of the veil repeatedly spoken of, it occurred to me whether an impure gelatine might not be instrumental in producing this bad effect. I have found plates which when tested proved to be perfectly clear, even with emulsions of high sensitiveness, if, previous to emulsifying, the gelatine had been soaked for an hour or more in a 10 per cent. solution of ammonium bromide, well kneaded, and repeatedly washed in pure water. One would be surprised to see the amount of dirt and foreign matter that will separate, by this treatment, from the very best gelatine. The method is, however, by no means new; eminent experimentalists, to whom our thanks are due, have called attention to it before now.

Captain Himly has recently published in German photographic journals, a series of tables relating to experiments with hydrochinon solutions with the addition of ferri-cyanide of potassium, claiming as the result greater activity and the production of higher brilliancy and more delicate half-tones. Well aware of the practical advice generally given by that author, and notwithstanding the difficulties of reducing the extensive tables for practical purposes, I made this experiment.

To one hundred c.c.m.=3½ ounces of the normal developer, I added successively, 5, 10, and 15 drops of a 10 per cent. solution of ferri-cyanide of potassium. The result was astonishing and exceeded my most sanguine expectations. The negative developed rapidly and with splendid brilliancy. The process required a much shorter time than usual, and the time of exposure might have been materially reduced. To commence developing with the ordinary solution and then add from five to ten drops of the ferri-cyanide as the process is going on, possibly will produce still better negatives.

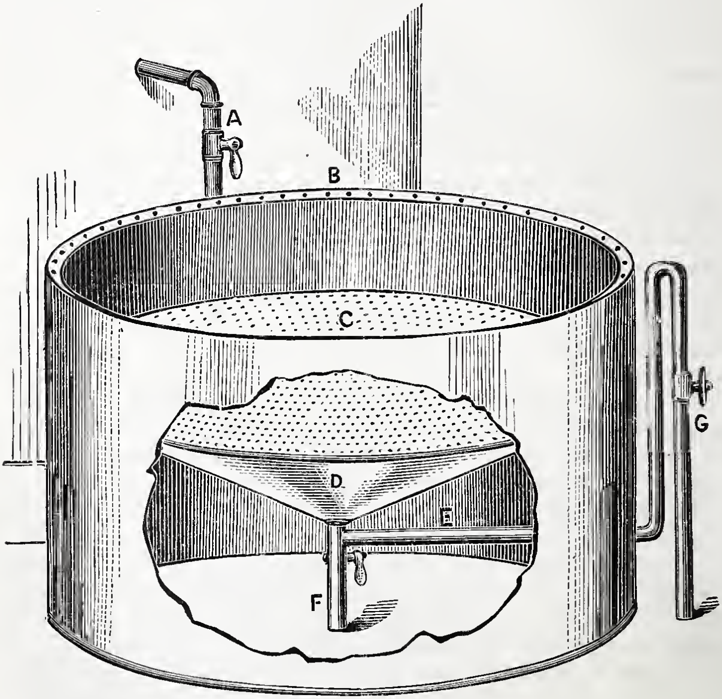
Captain Himly's method deserves our careful consideration.

Friedrich Müller.

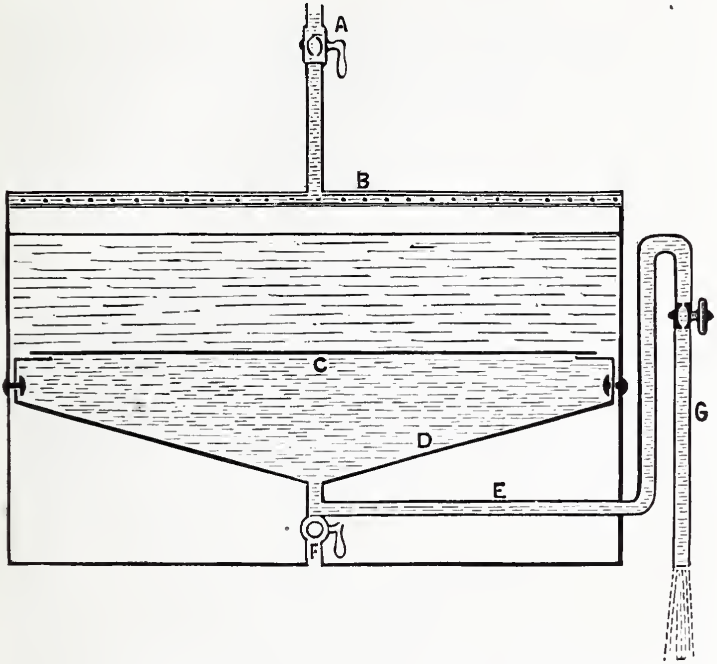
◆

A CONVENIENT WASHING TANK.

The tank here described I have used with entire satisfaction. It is made of galvanized sheet iron, circular in form, the diameter and depth depending upon the number of prints to be washed. The bottom is funnel-shaped and connected in the center with a siphon pipe. A circular leaden supply-pipe, perforated with small holes, extends around the upper inside of the edge of the tank. The holes are made at such an angle that the water spurted therefrom keeps the prints in constant motion.



About four inches below the supply-pipe is a perforated false bottom made also of galvanized iron. This prevents the prints from being drawn into the siphon, thereby preventing its action and also allows them a few moments in which to drain each time the tank is emptied.



a. Supply pipe. *b.* Circular perforated pipe. *c.* False bottom. *d.* True bottom. *e* and *g.* Siphon. *f.* Pipe used for cleaning tank.

The uses of the different stop-cocks will be readily understood without any further description.

J. R. Swain.

BLISTERS AND HOW TO AVOID THEM.

Put the water for your fixing bath, say four pints, on the stove and heat it as hot as you can bear your hands in it—almost boiling hot, pour it into your fixing dish and add one pound of hypo soda and a small lump of bicarbonate of soda. Dissolve and put your pictures in the water for from ten to twenty minutes, or until clear, turning them over constantly. Take them out one at a time and throw them into water with salt dissolved in it; not a bucket of water with a handful of salt, but with enough salt dissolved to bear up a potato. Keep them there for ten minutes. You will now not be able to see a single blister. When, if you had fixed them in cold solution you would have seen, perhaps, a hundred. You can now mount and finish in the usual way and will have clean, bright pictures. The washing must be continued after coming from the salt solution for some time to remove all the salt as well as the hypo.

C. A. Smyth.

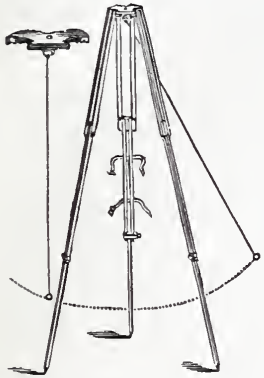
TIMING EXPOSURES IN THE FIELD.

A SECOND "stop" watch is the best thing, of course, for timing photographic exposures in the field; but all cannot afford the luxury of such an expensive instrument. There are complicated clock-work shutters which also time an exposure accurately, but these, too, are rather expensive and beyond the reach of many photographers. An ordinary second watch is good enough for determining the duration of very long exposures, but it is difficult to accurately measure a few seconds exposure by this means. An excellent plan is to mentally count the seconds during an exposure; and by practice, a remarkable accuracy may be obtained in this method of timing. Counting twice the number of seconds required for an exposure, I have found to be the easiest way to insure accuracy; though others may find it simpler and easier to count one for every second. In either case, practice at first with a watch is necessary, of course, before one can safely rely on this simple method of timing.

A very cheap and simple contrivance for accurately timing exposures in the field was suggested on a recent photographic outing by Mr. James Hall, photographic editor of the New York *Tribune.* It consists of a cord exactly one metre (39.37 inches) long, at the end of which is attached a lead weight of globular form. The exact weight of the lead does not matter. (Mine is exactly two hundred and ten grains and is more of an oval than a round form). The vibrations of this pendulum are exactly one second in duration, and it matters not whether the arc traversed be large or small, for the speed of the pendulum varies in accordance with the size of the arc described. If that be larger, the pendulum moves faster; if smaller, slower; *but always at the rate of one second for each vibration.*

The length of the pendulum from the point of suspension to the weight must be always, however, the same. An ordinary piece of twine will stretch more or less with use, and so become a little longer, and work, consequently, slower. It is therefore better to use a silk cord or even a flexible wire for this purpose. The weight should be as nearly as possible in the form of a globe, as in this shape it offers the least resistance to the air.

The pendulum may be held in one's hand, and thus swung during the exposure; but a more convenient way is to hang it to the tripod top, beneath the camera, and let it swing between the tripod legs. It might be easily secured to the tripod screw by means of a small loop as shown in the cut. When an exposure is to be made, the pendulum is started by a slight motion of the hand, and allowed to fall into regular vibrations before the cap is removed. The slide is then withdrawn and the plate exposed, while the pendulum beats the seconds with accuracy beneath the camera. One need not watch it closely, as in the case of a watch, for the motion is visible even though the operator be looking on the scene before his camera; and he can recap the lens at precisely the right moment.



This method of timing is really much simpler than it may seem from the description. It is not patented, and any reader of The American Annual is therefore at liberty to avail himself of the method if he so desires. *W. Irving Adams.*

MAKING GOLD—A GOOD INVESTMENT.

Probably most photographers prepare their own chloride gold. If there are any who do not, they are either careless of their own best interests or do not know what an easy and simple matter it is to do so. To such, this article is addressed.

For two or three years I have prepared my gold in the way here given and have no occasion for trying any other method.

Do not buy old gold from the dentist or use coin, but get C. P. Gold from the refiner. This gold is in thin sheets and is easily dissolved. Any refiner can furnish the pure gold.

Put into a graduate

C. P. muriatic acid	7½ drams
C. P. nitric acid	2 drams

Place C. P. gold, 4 pwt. (108 grains), where the poisonous fumes can escape in the open air. In an hour or so the gold will be dissolved. I use no heat; I have a G. S. bottle that will hold 21½ oz. Pour the acid gold into this bottle, then fill up with pure water making 21½ oz. in all.

In every dram of this solution there is one grain of the chloride of gold, so that one knows just what amount he is using.

For neutralizing the gold solution I always use prepared chalk, procured at any drug store. I have toned 20 sheets of paper using only 10 drams of this gold solution. (Toning solution ¼ oz. acetate soda, water 16 oz., gold added two hours before use.)

Some brands of paper might require a little more gold.

When I prepare my toning solution, I use 11 drams gold solution for 20 sheets of paper. For economy, ease of working and good results I want nothing better.

A word as to the literature of the profession, get all the annuals and journals you can possibly pay for, for you can't afford to deny yourself the inspiration gathered by reading the experiences and studying the works of those high in the profession. For myself, I pay not less than $20 per year for journals and books, though working in a small village, and I consider it the best investment I can make.

The *illustrations* of the journals alone, are, to me, worth more than the cost. *A. J. Whalen.*

TANNIN A SUBSTITUTE FOR ALUM.

Notwithstanding the general good qualities of American Dry plates, and the assurance given by every one of their manufacturers that they are perfectly free from a tendency to frill under any circumstances, it quite often occurred during the heated term last summer that plates were found to possess this annoying property to quite an alarming extent.

Usage and prescribed formulæ have made necessary the adoption of several methods to meet the evil, preventative in some cases, and curative in others; but it is not my purpose now to review in detail all that has been given in hand-books on the subject or to express in favor of one method or another. The frilling encountered has been so pronounced that it has been my desire to see it overcome effectually.

The first method tried was bathing the developed plate in an alum solution to which a certain percentage of chrome alum has been added, to wash and fix it, treat it with alum again before the final washing, all according to the orthodox doctrine.

We stopped frilling effectually, but through the cure we became cognizant of another evil, of which I had read and heard, but which I had never before encountered in practice. Nothing objectionable occurred with plates developed with ferrous oxalate, and everything proceeded in the normal way; but plates developed with alkaline pyrogallol, and to a much greater extent than those with which hydrochinon had been employed, acted quite differently. Probably owing to the great heat in the darkroom, the gelatine film, after an immersion in the alum bath of but a few minutes shrivelled up to such an extent as to make them absolutely unfit for printing. Seemingly the alum had permeated the pores of the gelatine and caused the shrivelling.

If such a plate has not been perfectly well washed after the alum bath and is then immersed in the hyposulphite of soda solution, the well-known decomposition of the two substances takes place. Sulphur and aluminium oxide will deposit and show in its mildest form, either as opalescent spots in parts, or on the whole plate, but otherwise, and more generally in the form of a fine whiteish powder adhering so tenaciously to the most thoroughly developed parts of the plates so as to make it quite impossible to remove it by washing under the tap, or by brushing or rubbing with the finger. The longer the plate has been in the alum the more distinct are these effects. What seemed quite remarkable, neither shrivelling or deposit occurred when the plate was immersed in the alum bath after fixing.

The whiteish deposit was reported at the time of the reintroduction of hydrochinon, and to avoid it, tannin was recommended to replace the alum for the purpose of hardening the film. The solutions of tannin used at that time were probably too strong; the gelatine film shrivelled up as with the alum bath; perhaps more so, and Tannin was put aside.

Under the conditions prevailing last summer I tried Tannin again but used a very weak solution, only one grain to an ounce of water. I found that it worked rapidly and effectually, a minute immersion being sufficient to re-establish solidity of the film.

If frilling began to show during development, or before it was quite completed a few drops of the same solution arrested or prevented it from spreading further. Owing to the properties of tannin it will as a matter of course, retard the process of developing considerably.

After having made these experiments I read in a foreign journal of similar observations having been made. The author of the article recommended the use of a tannin solution composed of

Crystallized Sulphite of Soda	2 drams
Tannin	32 grains
Water	16 ounces
Hydrochloric Acid	1 fluid dram

I have tried it with much satisfaction. It does not deposit a precipitate and cause the gelatine to shrivel. The compound keeps well, and, owing to the presence of hydrochloric acid and the evolving of sulphurous acid, a possible yellow tone of the plate is entirely removed by bleaching resulting in a clear, solid, and good printing negative.

Charles Ehrmann.

HOW TO MAKE THINGS.

My imagination has been a good deal touched from time to time, by the fact that many of the great inventions in photography have been the productions of amateurs. Another thing that has struck me in reading photographic publications is that it is very easy and cheap to construct any piece of photographic apparatus. Every now and then you will see an article in a photographic magazine showing how to make a camera, for instance, that will cost about 67 cents, and which will take pictures just as good as a 45 dollar one.

There is in England a magazine entirely devoted to showing people how to make articles that are useful, and, alas! expensive when bought from the regular dealers. I even see similar articles in the PHOTOGRAPHIC TIMES ANNUAL, and so, perhaps a few words on some notable inventions of my own that have not attained the public celebrity which they undoubtedly deserve, may be of interest to those who are handy with tools, or who have a genius for invention.

For fear it might be thought that I am trying to advertise myself at the expense of the large circulation of this volume, I may say that I have no pecuniary interests in any of the inventions and discoveries which I describe. The world is free to use them.

First I shall tell about my alpenstock tripod.

In climbing mountains of Switzerland and America I always found the ordinary tripod a great nuisance, so I invented one. It was made of one piece of round ash, sawed so that it came together like a round stick, and separated into three legs. There was a brass piece on top to which the three

Photographed by Charles Ehrmann. SOUTHERN FRUIT (AN ORTHOCHROMATIC STUDY). Electro-Light Engraving Co ., N.Y.

legs were hinged, and the point of the alpenstock was shod with brass. A couple of brass rings were put round this alpenstock when not in use as a tripod. These rings were slipped off and the tripod set as an ordinary tripod is when required to hold up the camera. It looks very beautiful, and has attracted a great deal of attention from amateurs who have dropped into my room and seen it standing in the corner. It works first rate as an alpenstock, as I can testify after having climbed the mountains of Switzerland with it, and also those of Vermont and Western North Carolina. But alas! it is not the thing as a tripod, it is too shaky in the legs and the least touch of wind or hand will make the camera quiver for ten minutes. The legs when separated are weak, and so I have abandoned it as a mountain tripod, and now use a "Daisy Tripod," made by the Scovill Company, which packs away out of sight in my valise.

My next mechanical achievement was a perambulating developing box. This I did not make myself, but drew the designs for it to scale and had it constructed by a cabinet-maker in Detroit, out of very light dry cherry. It is a beautiful piece of workmanship, and is now a fixed ornament in my own house. It was built like an oblong box, and was designed to stand on a tripod. The main part of the box was perpendicular, and contained twelve compartments, six on each side of the sheet of red glass. Into each of these twelve compartments went two eight-ounce bottles. These bottles I bought because they were square and fitted exactly into the compartment. They were to contain everything necessary for developing and for printing. The developing was done on the lid of this arrangement, which was held in place by a couple of straps depending from the main box. Tacked to the inside of the box was a great piece of black water-proof cloth, which enveloped the person who stood up inside of this thing to work at his developing. I expected to be able to develop a plate with this anywhere in the field, after taking it. There were twenty-four bottles, as I said, altogether. Those in the inside of each compartment contained solid chemicals. The bottles on the outside held the liquid chemicals—solutions for developing. The big cloth folded up inside and when the affair was closed it was a neat-looking, reddish, cherry box, with a handle on top of it. I built this so as to have it cheaper than the ordinary instrument of the same kind which is supplied by the trade. But alas! when the bill came in, I found that, besides spending all my time on getting the thing made, the cost was about ten per cent. higher than I could have bought the affair complete for, and the worst of it is, that I have never been able to take it out in the field with me as it is so heavy. Besides, I found that, short of breaking the thing with a sledge-hammer, I never could get the inside bottles out of it. It is so solid and heavy, that I guess I will transform it into a cabinet organ or make a sideboard of it.

My next discovery, which I give free to the world, is in relation to a portable developer. I generally use Beach's developer, but one time when I took a lot of it to the far North with me, the developer froze solid in my trunk, and then melted in a warm baggage room with appalling results. The freezing broke the bottles, and when it thawed it developed a new suit of clothes and half a dozen shirts, and these were so frightfully over-developed that I had to give them away to the poor, as I now give away my great discovery in relation to pyrogallic acid.

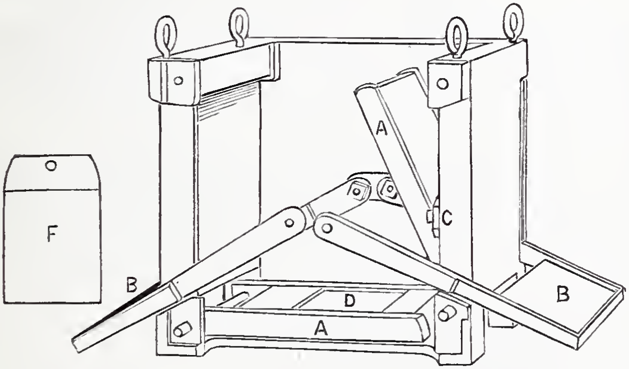
I know a great many photographers who use pyro dry, so a bright idea struck me one day, and I put it into practice: I bought a box containing a hundred gelatine five-grain capsules, the largest size capsule, I understand, that is made. I poured the pyrogallic acid from a new ounce bottle on to a sheet of white paper, and started to fill the 100 capsules. I found by weighing that each capsule when packed full contained about four grains of pyrogallic acid. The 100 capsules took up the ounce of pyro. Then, I felt I was ready for a campaign. Up to this point the thing worked all right. When I opened a capsule and dropped the four grains into water and then put in the alkali, a curious change came over the developer. Before I got it over the plate it was almost jet black. One solution developed a plate reasonably well, staining it somewhat, but after that the developer was so far gone that it was impossible to use it on anything else. I mixed up a fresh developer and watched its action. Little clots of black, browny substance appeared to form here and there in the liquid; these slowly dissolved and clouded up the mixture, and finally in about ten minutes the whole developer was black. I don't know what the matter was. I only know that I lost 100 able-bodied capsules and one ounce of the best pyrogallic acid that I could buy.

I could give you several pages more of similar inventions and discoveries, but I doubt the practical use of doing so. I have come to the conclusion that so-called cheap mechanism is a delusion and a snare, and that the very cheapest thing in the world is to buy the best apparatus and the best chemicals from the best house you know of. I have permanently retired from the invention and discovery business.

Robert Barr (*Luke Sharp*).

THE SUBMARINE PHOTOMETER.

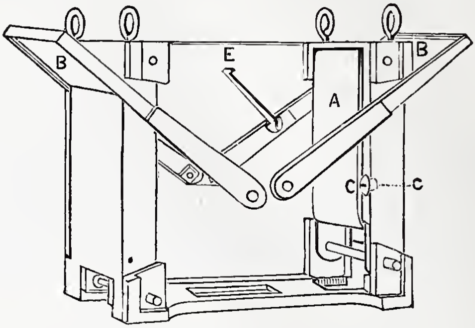
The Submarine Photometer, as its name implies, is intended to determine the intensity of light at various depths of the ocean, or elsewhere. The result is to be obtained by means of sensitive plates sent down, and so enclosed in the photometer as to be protected from light until the depth desired is reached, when, at the will of the operator they are exposed and again protected.



The Photometer is a metal box about six inches square, open at the top, and contains in two opposite sides each a drop, *A A*; one containing the plate, the other designed to cover it after exposure. The drops are released by the action of wings *B B* projecting through the sides and acting from their resistance to the water, according as the photometer is raised or lowered. The drops are secured within the sides by metal buttons *C* which buttons are turned by the arms of the wings, and the drops allowed to fall.

The photographic plate 2x2½ inches is secured at *D* within the drop, (having previously been immersed in transparent varnish) and is covered by a section of a sensitometer screen and protecting slide F, the latter being withdrawn before immersing the photometer.

When the apparatus is a short distance below the point where the exposure is desired it is raised to that point, when both buttons are turned by the action of the wings while only the drop containing the plate is allowed to fall to the bottom of the box. The other is prevented by a projection *E*, attached to the arm of its wing.



When, however, the exposure has been made the photometer is again lowered a short distance, whereupon the other drop is released to fall upon the first and cover up the exposed plate.

The photometer is then ready to raise, and the plate to be developed.

The study of submarine light has been of interest to naturalists in connection with the forms of life found in the ocean, and experiments have heretofore been made with apparatus designed by me for the U. S. Fish Commission while attached to the Fish Commission steamer "Albatross."

The photometer above described is an improvement, in my opinion, over the former methods, and I shall be glad to communicate results another year.

I have not at hand the reports made by Captain Tanner of the "Albatross," but enclose a short statement of experiments made in the Gulf of Nice.

PENETRATION OF LIGHT IN WATER.

Further experiments have been made by MM. Fol and Sarasin to determine the depth to which light penetrates the water of lakes and seas. Their method of observing consisted in placing gelatino-bromide photographic plates at different depths under the water; the plates being lowered by a sounding lead, and protected from the action of the sea water by a varnish. Experiments were made about 1,300 to 1,400 meters off the Cape of Mont Boron, at Villefranche in the Gulf of Nice, and in water about 550 meters deep. During April the limit of penetration of the daylight about midday during fine weather, was found to be about 400 meters; an observation which confirms the previous conclusions of the authors as given in our columns. Other observations showed that there is a penetration of 300 meters all the time the sun is above the horizon, and of 350 meters during eight hours of the day. According to experiments of Bunsen and Roscoe, the active intensity of blue sky on April 21, at Vienna, was 33 at 8.30 A.M., 38 at noon, and 14 at 6 P.M., while that of the sky and sun together was 75 at 8.30 A.M., 133 at noon, and 15 at 6 P.M.

George H. Read,
Paymaster, U. S. N.

DRESS AND DRAPERY.

Flaxman's parallel between drapery and language is an apt one. "As the beauties of the mind," he says, "are seen through and adorned by language, so the graces of the figure are set off by drapery."

It is true that many an ungainly form dissembles under an artfully contrived costume, so that we are often tempted to carry out the witticism of Talleyrand and believe that drapery, like language, is more serviceable in concealing than in revealing. Still there are those who have so large a share of inborn, or else acquired grace, that the most ordinary garment becomes them exceedingly as if nature herself had pranked them out in it.

Our dress, like new honors, requires the aid of use to make it set well upon us. "His garments are rich, but he wears them not handsomely," says the shepherd in "Winter's Tale," when he sees the peddler Autolycus strutting about in the Prince's clothes. But we must not forget what Stern tells us, how "the sweet look of goodness, which sat upon Uncle Toby's brow, assimilated everything around it so sovereignly to itself, that even his tarnished gold-laced hat and huge cockade of flimsy taffeta became him, and though not worth a button in themselves, the moment he put them on they became serious objects and seemed picked out by science to set him off to the greatest advantage."

We can imagine the photographer saying, here: "O! but these gentle folk you speak of are not so plentiful. We are obliged to deal with all sorts and conditions of men, to make the best of what fashion chooses to suggest or the whim of the sitter to dictate."

Adapt your art as the painter does to the changes of fashion and still give us something beautiful. There is no excuse for the total neglect of the study of the effect produced by proper disposition of the drapery with respect to the figure.

Gainsborough, and even Hogarth, turned to good account the eccentricities of their times, and some of the styles then in vogue were ridiculous enough. Nowadays no one ought to complain of any lack of artistic feeling in dress.

Our modern styles of dress are based on certain general principles of art which readily lend themselves to the picturesque.

Fashion is controlled more directly by taste and springs more immediately from the demands of utility and comfort than ever it did before.

We are sure there is abundant material for the expression of artistic feeling in our modern everyday life. Our painters appreciate this, finding pictures in our drawing-rooms, our parlors, our workshops, in the busy crowd, in frock-coats and in flounces.

We can call to mind numerous paintings, mostly by French and Americans, of scenes and incidents of our modern so-called artificial life, quite as charming as mystic milk-maids and inspired shepherdesses. We have even seen the tile-hat and the derby made accessory to pictorial effect.

We are just fresh from reviewing the collection of photographs exhibited at the Boston Convention. Our critique is, that technical excellence is still at as high a notch as heretofore, but that there is room for a good deal more artistic expression. Professional photographers in this respect are behind the amateurs.

Among other shortcomings was the disregard of the value and importance of drapery and costume.

Several fine pictures were marred by the carelessness shown in the management of the garments and the accessory hangings. The excellencies of the photograph would have been emphasized by a little care in the arrangement of the folds of the dress.

The subtilty of the folds of a robe refuses to be reduced to mathematical formula. There is no such thing as the equation of the curve of the fold of a satin dress. We must have taste in ourselves, and we must imbibe fresh draughts from the painters. Reubens, Teburg, Maes, Van Steen, and others of the Flemish and Dutch schools, and many of the modern French, delight in the delicacy of light and shade in drapery and dress. There seems to be a sort of perversity inherent in the photographic profession to court incongruities.

To the antique we are indebted for our standard of the perfect human form, and for marvelous conception of drapery.

The close adherence of the garments to the limbs, revealing to the imagination the ideal form beneath is truly poetry in stone, but the attempts which photographers sometimes make to simulate statuary by posing and clothing in a classic style human models are not only sensational, but often ridiculous, if not vulgar.

It is altogether out of the province of photography to suggest the indefinite beauty of the plastic by whitewashing the real.

For conceptions of beauty in drapery they should study the painters, not the sculptors, or if they do study the antique, be not so precise and literal in their renderings.

Study Massaccio and Giotto, take suggestions from the flowing robes of Titian's Assumption, Da Vinci's Mona Lisa, from the splendid brocades and satins in the pictures by Paul Veronese, Reubens and Velasquez, and do not try to make Galateas, Dianas and Psyches instinct with life, clothed in tissue and mounted on wooden blocks painted white to look like marble.

There are plenty of Dianas and Galateas in the costumes of real life.

Did the photographer ever stop to consider what grace is added to an attitude in itself graceful by length of line to a robe, and how often grandeur is imparted to a figure in itself ordinary? There is a special elegance in the long flowing lines of a lady's habit, more becoming to her native grace than all the devices made of crumpled tissue paper.

The mania to be photographed in flimsy gauze, with illusion wings, is invading the staid ranks of society, and maidens *en embonpoint* fail to appreciate the incongruity between their avoirdupois and the butterfly pinions intended to elevate them to the empyrean.

We are glad to see going out of fashion that absurd method of disposing of a lady's train by huddling it up about her feet in a corkscrew style, as if the operator was in mortal fear it would not find accomodation elsewhere in the photograph.

This part of a woman's apparel is capable of such a variety of pleasing arrangements, that only a perverted ingenuity could make such a disposal of it.

The train frequently serves the purpose of breaking the floor line of the picture, and so becomes in itself a line of beauty contrasting or harmonizing with other lines.

The old masters sometimes, like the photographer, had to deal with ungraceful subjects.

There is a picture by Van Dyck; the lady herself was not ungraceful, but she chose to wear a very outlandish dress—to which, if any prominence had been given in the picture, it would have neutralized even the genius of Van Dyck. How did he get over the difficulty and yet give us not only a pleasing but a beautiful picture? Simply by an ingenious management of the background hangings—the drapery. By means of a light ground opposite the light side of the dress and by help of a curtain which catches and emphasizes the light near the figure, he has distracted attention from the uncomely dress and made the effect of the whole picture full and rich to the eye.

In a full-length figure a perfectly plain background is hard to manage so as to give proper atmosphere and present the appearance as if the figure were attached to the background.

Drapery, you can easily see, is of immense importance in such a case. The relation to the dress must be considered. The background determines where the figure should be relieved, and on judicious management of the drapery and the dress everything depends. If you have a beautiful form to pose against a ground, you can afford to let it come out distinctly against it; if the model is not remarkable for grace, give the background more prominence, so that the figure retires somewhat.

You can easily see that if your sitter has a good and a bad side, how that the bad side can be obscured by losing it in the darker part of the ground.

But if I continue on backgrounds I shall lose my subject there. Now a word or two about the quality of the textures suitable for representation by photography.

All stuffs of soft flexible nature like woolens, cashmere, etc., specially lend themselves to making beautiful folds. We are ignorant of the names of these flexible fabrics, but here your fair friends can aid you.

We would say, avoid velvets and plushes. Though they look well to the eye, they do not photograph so well. They show a wonderful falling off in the half lights so essential to drapery. Cheese cloth of fine mesh is a cheap and excellent stuff for drapery. In photography we have to take in consideration the color of the fabrics. Dazzling white is to be avoided. Light creamy tints are to be preferred for bright hangings, and the buffs for dark.

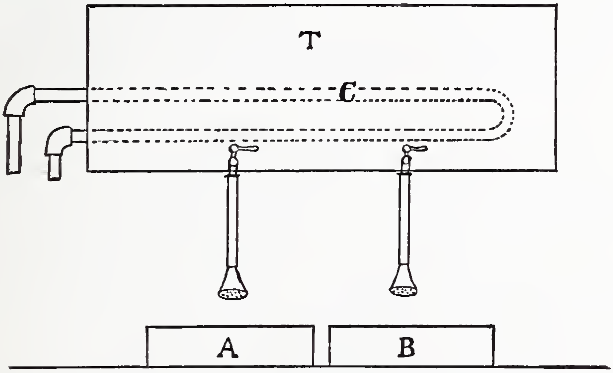
In developing light draperies do not, as some do, sacrifice the half-tones of the face to secure brilliancy of the garment. Look to the perfect development of the countenance first. Meanwhile, keep down the proportion of the pyro to the minimum, and you will find when you come to give your attention to the drapery that it is soft and rich in detail, and may need only a little addition of pyro to give it vigor.

John Bartlett.

AN EFFECTIVE METHOD OF WASHING PRINTS.

So MUCH has been written upon this much discussed subject, that it would seem as though nothing new could be said. The apparatus used by the writer, however, may be new to many, inasmuch as no similar arrangement has ever come under his notice.

It is generally conceded that the quicker the operation of washing the better, provided, of course, the hypo is thoroughly eliminated. There are many machines used for this purpose, the principal objection to which is, that while they may be very effective and answer well for the smaller sizes, the larger prints are very apt to become torn or bruised by the rough treatment they receive. In soaking the prints in a tank of water they are apt to stick together and become stained. Long soaking also destroys the brilliancy of the prints. The method of washing by hand, which is the one used by the writer, is open to none of these objections, and, provided the work can be expedited, must commend itself as being quite efficacious.



In the diagram, T is a tank, lined with copper, six feet long, eighteen inches wide, and twenty inches deep. A brass tube, C, runs its entire length in a loop, the two ends being connected with the steam-heating pipes. The water in the tank is thus kept at a uniform temperature. A pipe from the water supply keeps the tank filled. Two trays, A and B, each 20 x 24 inches in size and four inches deep are set under the tank upon a grating in the sink. Directly over the center of each tray is a faucet in the side of the tank connected with a short piece of rubber tubing at the end of which is a rose.

When the prints are ready for washing they are placed in the tray A, and the water turned on at the faucet. The prints are lifted one at a time and held for an instant under the spray from the rose, and then transferred to the tray B, which has been previously filled with water. This operation is repeated back and forth six or eight times, the trays being emptied each time the prints are taken out, and the water kept constantly running through the sprinklers. A row of holes along the sides of the trays about an inch below the top, allows the water to run off without danger of the prints being carried over the edges. The spray from the rose upon each print separately, and the constant changing of the water in the trays is sufficient to remove all traces of hypo in a short time.

Henry G. Peabody.

DISTORTION.

There has been so much written about photography that scarcely anything remains to be said. There is one subject, however, that seems to be worthy of attention, and that is the distortion produced in the effort to get a large image on the plate by placing the camera near the sitter or model when using a lens of moderate length of focus, or even when a long-focus lens is used to make the image cover its normal-sized plate.

In my practice I use a 19½-inch focus lens that will cover a 12x15 plate, a 6½x8½ plate getting a large image at a distance of 20 or 30 feet from the subject, instead of approaching the model so as to make the figure as large as a 12x15 plate will hold. If the 12x15 plate is covered we have distortion; of course, the distortion is on those parts of the figure that are beyond or in front of the plane of the head, which is always taken as the guide to the proper size of the figure.

On keeping at a proper distance from the subject, such objects as a 4 or 6-horse tally-ho, an 8-oared shell in fore-shortened view, or any long arrangement of subject, the proportion is held perfectly, instead of having, in case of the tally-ho, the leader's head as large as the pole-horse's body, the proportion is correctly sustained and a large image obtained, and this can only be had by the use of very long focus lenses. Their expense may be urged against them, but no first-class work is done with improper tools. The eye can become callous to defects by constantly looking at distortion, as the ear will lose its perception of true tone by constant practice on a badly-tuned instrument.

Hence, I say, use long-focus lenses on comparatively small plates, get good work, instead of bad in the effort to get a large image even at the cost of being worthless.

Obtain work that is valuable, and in which objects at different distances hold their normal proportion.

George B. Wood.

MEMORANDUMS FROM MY NOTE-BOOK.

To UTILIZE silver paper 18x22 inches for 5x7 work, to the best advantage, get that which is coated to the edge on all but one side. After silvering, turn the sheet over and divide it as follows. Measuring across the sheet, divide it into strips; one 4½ inches wide and the other two 6½ inches wide each. The 4½ inch strip will make three 4½x6½ pieces, with a small piece remaining. The balance divided into 4½ inch pieces, will give ten 4½x6½ pieces. This gives a total of thirteen pieces to the sheet, and no waste worth noting. Remember that a 5x7 negative prints 4½x6½.

Summer and winter, always soak your negatives in a saturated solution of chrome alum. My hypo bath is saturated with it. When washed you can then dry your negatives over a hot stove, in three minutes. Saves time and space.

Do not forget that a negative dried by artificial heat is denser than one dried by the ordinary atmosphere.

In making interiors, do not forget to stop the clock on the mantel.

Mark on the brass guide, attached to the camera bed, the position of the lens board focused at five feet, ten feet, fifteen feet, twenty-five feet, and general focus. You may some day break your ground glass. Do this to-day.

To cut lantern-slide mats neatly, quickly and accurately, make a form the shape and size of the opening required, of thin sheet brass. Bend it in the middle until the two sides almost meet. To use it, double the paper, to be used, in the middle and insert between the leaves of the brass form. Holding the form between the thumb and forefinger firmly, cut around with a pair of scissors.

Ferricyanide Potassium, 3 grains; hypo, 20 grains; water, 2 ounces, will reduce a negative locally, without staining. Soak the negative fifteen minutes in water, then apply the solution to the spot with a brush. Immediately after application, dip the negative into clean water, and again apply the solution. Repetition of this treatment will gradually reduce the part without leaving any bad effects of marking.

Cyanide potassium, 10 grains; water, ½ pint, will dissolve the metallic deposit, often found on negatives which have been restrained with bromide potassium, in developement. Harden the negative with an alum bath, and leave in the above solution until the stain disappears. Wash thoroughly.

Clean a spoiled dry-plate thoroughly. Coat with a solution of gelatine, about 1 to 30. When dry, flow with the ferro-prussiate solution, used for making blue prints, and set up to drain. After thoroughly drying, place behind a negative and print as usual. These transparencies are very attractive.

Robert E. M. Bain.

COMBINATION OF GUILLOCHIR-RULING AND RELIEF MACHINE WORK WITH PHOTO-LITHOGRAPHIC TRANSFERS; AND MEANS FOR ETCHING-IN SHADINGS.

The photo-lithographic transfer having been made in the ordinary way, those portions of the stone upon which it is desirous of introducing machine-skies, ornamental groundwork, moireès, etc., should be very carefully polished with moistened binoxalate of potassium (salt of lemon), or oxide of iron (Venetian red), and gum-arabic, using a stump of wood or a small leather tampon for the purpose.

Thus prepared, the stone is gummed all over and allowed to thoroughly dry.

Well wash off the dessicated gum, and with a thin acidified gum solution stop out all those parts of the stone which remain unpolished. This is to prevent the fatty substances of the etching ground from penetrating the stone.

A very stable etching ground can be made as follows: Take forty parts of asphaltum dissolved in oil of turpentine (one of the former to three of the latter by weight) one hundred and sixty parts of coal-tar and four parts of white wax, previously melted with essence óf turpentine to the consistency of honey.

A sufficient quantity of the above etching ground is poured on to a clean inking slab and spread thereon equally by means of a rather firm typographic roller (a few drops of turpentine can be poured on the slab to assist this if necessary). With the roller thus charged, the stone on which the machine-ruling, etc., is to be made, is evenly coated with etching ground, by rolling lightly and not too hurriedly; a trial or two had better be made beforehand on a plain stone so as to ensure eventual success. Thus prepared, the stone is to be laid aside carefully guarded from particles of dust, until the etching ground has lost all tackiness.

(A properly prepared etching ground should on no account adhere to the diamond point while ruling, neither should it split between the lines.)

If by mistake any of the ruled lines should impinge upon the limits of the protected parts, it will be necessary to cover them with asphalt solution before etching is commenced.

After complete dessication of the asphalt, make a border round the edge of the design with bordering wax, such as is used by copper-plate etchers, moulding one corner into a spout shape to facilitate pouring off the etching fluid.

This is composed as follows:

Hydrochloric acid	10 grams
Pyroligneous acid	50 grams
Water	1000 grams

The small gaseous bubbles that make their appearance during the etching should be removed by passing a camel-hair brush lightly over the surface of the stone.

As soon as the *mordant* has acted sufficiently pour it off and well flush the stone with soft water and dry as quickly as possible, using a pair of bellows to facilitate the drying.

To produce a gradual softening towards the edges of the skies, etch very slightly at first, then stop out the parts which should be subdued with a thick solution of lithographic drawing ink, allow it to dry thoroughly, then continue the etching.

Finally, strip off the bordering wax and cover all the machine work with litho-drawing ink of a thick consistancy, rubbing it in well with a piece of sponge, or the tip of the finger, fan dry, and then wash off, together with the etching ground and the subjacent photo-lithograph; using plenty of turpentine and soft rags. The clean stone is next rubbed with fatty transfer ink, which is allowed to dry in for at least one hour; at the expiration of which time roll over the surface with ordinary lithographic ink.

Several modifications are permissible in this process. For instance, instead of machine ruling, free-hand work with steel or diamond point as well as roulette shading can be made and etched on the stone.

As the inking-up must be done with a roller, it is obvious that the biting-in should not proceed too far, otherwise it will be impossible to obtain good impressions.

(The bordering wax, which should be neither too brittle nor too soft when cold, is an admixture of ordinary yellow bees-wax, to which Venetian turpentine and a small quantity of olive oil are added while it is in a molten state. This is thoroughly incorporated by stirring until cool; then it is well kneaded and formed into strips for use. It should be slightly warmed over the flame of a spirit lamp before attaching it to the lithographic stone and the lower edge of the wax strip pressed well down on the stone with the stump end of a lithographic etching point wetted with water).

George Scamoni,

Chief of the Artistic Helio-engraving Department of the Imperial Russian State-paper Office.

DON'T HURRY!

Some hundreds of landscape photographs taken by amateurs came into my hands; a few of them admirable in every way, but the majority quite unsatisfactory. If I should be called upon to point out their principal defect I would condense my criticism into the few words: "*Too much hurry!*" No approach to perfection can be reached in any branch of art without painstaking and patient work. When in view of some beautiful scenery which we want to reproduce, the first mistake is generally made in not choosing the best standpoint for the camera deliberately. Not every landscape which may appear beautiful to our eyes will, if taken "at sight," produce a satisfactory photograph. The camera generally must be shifted to various places before obtaining on the ground glass a picture with graceful outlines in the distance, a pleasing middle ground, and especially a forcible and attractive foreground. Here arises a new difficulty. Your friends are, perhaps, picnicking and desirous of all being photographed. Don't hurry to admit them, as in a wild, rocky and solitary place the introduction of some hilarious group would entirely spoil your picture. In a cheerful and sunny landscape such a group may be admitted and even add to the landscape, provided that you place it in a modest corner of the foreground and have sufficient command over the crowd to have the faces turned "the other way" and not to admit any burlesque attitudes.

Another point will have to be considered in composing your picture deliberately, viz., the concentration of the highest light, which need not be in the centre of the plate.

The observance of these points will go far to help make a picture, and not a mere photograph.

The composition of the picture being completed, avoid "too much hurry" in exposing. Give plenty of time, especially in shady places. Remember that over-exposed plates, to a certain extent, may be corrected in developing—under-exposed ones never.

Don't hurry development. Begin with a half-strong developer; a minute's time will show you the "true inwardness" of your plate. Add the full developer or lessen the strength of it with some retarder, but always be patient if you would obtain the best results.

Give plenty of time for fixing if you want permanent results. More plates are ruined by under-fixing than by under-washing. The perfect elimination of the hyposulphate of soda is of course very important. Twenty minutes washing in the Scovill boxes, and an additional five minutes under the tap, using a tuft of cotton, or rubbing with your finger, *faute de mieux*, will clear the negative. Before dry, clean the glass side with water and a few drops of muriatic acid.

When the plate is dry, don't hurry to begin printing. Examine your negative. Some parts may be too dense, others too weak for a successful print. A *perfect* negative is very rare, even in the hands of experienced workers with orthochromatic plates. Their very best results may be estimated as one in twenty, those of the less experienced amateurs as one in a hundred.

Having tried to emphasize deliberation, I will pass to what I have to recommend.

1. If a negative is nearly perfect in your judgment, let it alone. If not, as is presumably the case, clear the too extravagant high lights by rubbing the parts over with a tuft of cotton and a drop of alcohol, repeating the operation as long as necessary. Next intensify the deepest shadows in foliage, etc., by rubbing some indigo blue on the palette with a drop of gum-arabic, and applying it with the tip of your finger to the darkest shadows *on the glass side* of the negative. Take but a little of the color at a time and press gently so as to leave the marks of the skin, and give the retouch a "hatchy" appearance, well suited to bring out the thinner parts in the foliage, etc.

2. Over-exposed and thin negatives ought to be printed on Obernetter's gelatine chloride of silver paper to get results, not reached by any other printing paper.

3. A gelatine negative needs no varnishing if printed from on perfectly dry paper. An unvarnished plate offers many advantages for improvement later on by reducing or intensifying, and without the troublesome labor of removing the varnish, an operation always more or less dangerous.

4. A full-sized print from a 5x8 negative taken, as it generally is, with a wide angle lens, is a photographic lie. Have the courage to sacrifice all but the more central and the most interesting parts of your negative and print under an irregularly cut oval mask, covered with tissue paper and exposing less than two-thirds of the negative. The artistic results obtained by this method of printing, especially on "matt" paper, will be a pleasant surprise to many.

Karl Klauser.

PUTNAM'S ESCAPE.

The scene of Gen. Israel Putnam's famous ride down the stone steps at the time of his wonderful escape from the English soldiers is, as all probably know, at Greenwich, Conn.

The incident is no doubt familiar to all, occupying, as it does, a prominent place in American history as one of the many noted events of the Revolution, but a recital of the details may perhaps be of interest to many.

The hill shown in the picture is as it appears to-day, but the hill of to-day bears little resemblance to the hill of '76. The old steps have long since disappeared, and finely cultivated lands occupy their place, but it was at this very spot that the ride occurred, and could some of the old trees speak they could tell of that memorable day and the brave old hero dashing over the rocks and off toward Stamford.

The old cottage has not changed, but stands just as it did in revolutionary times, with the exception of the stone addition, which has been added during later years, and it is regarded with pride and reverence by the people of Greenwich, and with curiosity by many visitors.

In searching for historical facts relating to "Old Put" (as he is commonly called) and his famous ride, I find that traditions differ somewhat, but such works as "The History of Fairfield County," and the "Life of Israel Putnam" agree in their records of the incident, which is substantially as follows:

Feb. 25, 1779 finds General Putnam quartered at the old house shown in the picture, then an old tavern, kept by one Israel Knapp.

This house is on the north side of the highway, and a short distance, perhaps 500 feet, back from the hill, and was used by the general for his headquarters during his stop at Greenwich.

On the hill-top in the lower picture, (taken looking west) stood an old meeting-house, near, or on the exact spot now occupied by the house seen on the left and almost hidden by the trees.

From this building leading directly down the steep incline to the hollow below, and ending about where the road now is, were the steps, composed of rough untrimmed stones, that had been placed there from time to time, for the convenience of the church people, thus forming an irregular stairway down the hill, for then the road came to the foot of the hill, near the steps, and there turned to the north, avoiding the steep ascent. Since then the road seen in the picture, has been cut through the hill.

Photographed by W. S. Waterbury

PUTNAM'S ESCAPE

Crosscup & West Engraving Co., Philadelphia

There were seventy steps in all; some exaggerated reports state that there were as many as a hundred, but there are no traces of them to-day.

General Putnam had under his command at this place about one hundred and fifty Continentals, and they were stationed near the old meeting house.

Tradition tells us that while the general was shaving, he saw reflected in his looking-glass, some of the British cavalry fifteen hundred strong, under Gov. Tryon, approaching.

At the approach of this body, charging at full gallop, the handful of Continentals, after firing a few shots, retreated to a swamp below the hill. Putnam, with his coat on his arm and the lather still on the face, mounted his horse and started toward Stamford, a village about five miles from Greenwich, closely pressed by the British.

Here local traditions do not entirely agree.

One states that on reaching the brow of the hill, the bold rider spurs his horse right onward over the precipice, and, amid a shower of bullets, one of which passed through his beaver military cap, takes his leap into history. Another states that he took the road going north for a short distance, then turning to his right into a cow path, taking a south-easterly course, dashes diagonally across the hill, which would be from the right of the picture to the left, passing about where the road disappears in the trees, and strikes the stone steps about one-third of the distance from the foot of the hill.

There were eye witnesses to the Putnam ride, both among the citizens of Greenwich and the troops under his command, and both accounts are based upon statements made originally by those who witnessed the occurrence, but which have been forgotten or misunderstood in the course of frequent repetition.

One thing, however, is certain that whatever may have been his starting point, he performed a deed which the rough riders who followed him dared not emulate, which is well worthy of historic mention, and is a glorious exploit for commemoration.

It is said that later, Gov. Tryon in admiration of Putnam's daring, sent him a new cap to replace the one that the bullet had pierced. *W. S. Waterbury.*

* * *

"THE DEVELOPER OF THE FUTURE."

A PRETTY close study of the current photographic magazines has led me to the conclusion that hydrochinon as a developer has not held its own during the past year. This impression has been confirmed by the report of progress made by Mr. W. I. Lincoln Adams at the recent convention at Boston. Since in my practice the reverse has been the case, I wish to give the reasons "for the faith that is in me," and to call attention to some of the probable causes which may have led to disappointment in the use of hydrochinon.

Undoubtedly too much was claimed by its enthusiastic advocates in behalf of the formulæ they first published, especially in asserting that it excelled all others in developing feeble impressions or extra-rapid exposures. It has not been proven that it has superior powers in this respect to others now in use, at least by any combination as yet proposed, but herein does not lie the claims of hydrochinon to be called the "Developer of the Future." It may be rash in these days of progress to forestall the future, in view, too, of the possible claims of eikonogen, but for the present at least, I have faith in hydrochinon.

Some operators, disappointed, perhaps, in this promised rapidity, have been induced to complicate their hydro. developer with certain of the accelerators and restrainers they have been taught to think indispensable in any developer, or others may have used the hydro. as an additional ingredient to their own favorite developer, instead of giving it a chance to manifest its own remarkable powers when not handicapped by additions which retard rather than enhance its rapidity. It would seem that many such cannot conceive of a developer which does not require ammonia or bromide, and will have no use for any which it is urged will actually work better without them.

As for my own belief, I must say that I have unbounded confidence that a formula will ere long be devised which will show the superiority of hydrochinon in this particular, as well as others in which it now excels. I have no cause to return to pyro., because I know that hydrochinon, in the combination used by me, is its superior in every respect except in rapidity.

The formula published by me in the American *Photographic Times* over a year ago, and which was the outcome of repeated experiments not proper to detail here, has been used constantly by me since that time, and with increasing satisfaction and certainty of results as experience has shown the necessary conditions to success.

The formula is here repeated:

No. 1	—Sulphite of soda	240 grains
	Pure water	4 ounces
	Dissolve and filter; then add	
	Hydrochinon (Mercks')	60 grains
	Which must be dissolved—every tiny crystal —by shaking, before it is put away for keeping in a dark place.	
No. 2.	—Soda carbonate (washing soda), a saturated solution. Which must be filtered occasionally to preserve absolutely clear.	

I have never used any other than Merck's Hydro., because when I found how perfectly soluble and free from impurity it was I laid in a liberal supply of the same which is still on hand. It is essential that every crystal should be dissolved in the sulphite solution, which necessitates from ten to fifteen minutes shaking. Should two or three little crystals be refractory and insoluble after this agitation they may be filtered out, for if left they will surely prove nuclei for commencing discoloration which would impair the keeping qualities of the mixture. With these precautions I find no difficulty in keeping it unharmed for weeks. It will, if kept for weeks, become straw-colored, but it remains clear without the addition of any acid, and its developing powers seem but little if any deteriorated. You will see that I add nothing to the soda solution. The proportion of sulphite combined with the No. 1 solution is sufficient to ensure its keeping: if more should be added or any acid put with it, it slows its action in increasing ratio to the excess added.

To develop a 5x8 plate take two drams of No. 1 and two drams of No. 2 and make up the bulk to four (4) ounces with pure water. I have used lately the celluloid films made by Allen & Rowell and John Carbutt, the superiority of which to glass plates need not be enlarged upon here. But I must say right here that with them *halation* is a thing of the past. I use the most rapid plates, and I am convinced that most of the disappointment which seems to have followed the use of hydrochinon has come from the want of sufficiently liberal exposure in the camera. This subject of proper exposure is too involved to be opened in such an article as this, which must necessarily be restricted: I can only say that practice and experience alone will give the proper timing, and that very little can be made of an under-exposed plate with any developer. With the hydro developer you may safely expose till the shadows have their full detail; the high lights will never develop opaque or too thin.

In developing a film negative I wet the pan with pure water and pour it out, then the polished side of the film adheres closely to the glass bottom and the developer flows freely over the surface. I prefer an "Acme" developing pan with a glass bottom and a reservoir, so that the developer can be kept in constant motion and the plate examined without danger of spilling the solution.

Now, as to progress of development, with a liberally timed negative the sky and extreme high lights will begin to show, with the hydro. developer above mentioned, in one or two minutes if the developer has been freshly mixed, and will then progress steadily and uniformly and as rapidly as it ever should, for I am not an advocate for rapid development, until the whole surface is veiled. It will not, cannot fog, except from exposure to light. The development is finished when the shadows show no white on the surface, to result in objectionable clear glass after fixing, and when the high lights show dark on the back of the plate. You will then have a negative full of detail in the shadows, with no "snow" on the high-lights, and of perfect printing vigor.

Your four ounces of developer will develop a second plate just as perfectly as the first, but *but not as rapidly*, and even a third, but very slowly this time.

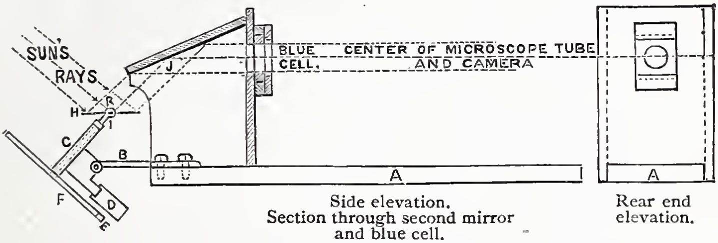
My practice is to keep the solution which has developed two negatives for a plate which my memoranda show may be probably over-exposed, in which case the *used* developer will be the only proper restrainer. Bromide is never necessary with hydrochinon and should not be used.

In case of an "instantaneous exposure," if a marine view, or a well-lighted group or street view, your normal developer as above given is all that will be required to give you perfect results; but if the lighting has been obscure your developer will need to be well mixed with *patience.* If your stock of patience should become exhausted, see that your plate is well covered with freshly-mixed developer, cover up your pan securely from the light, and go off and leave it for an hour. On your return you will find as much on your plate and in better condition than you could have got by the most persevering and approved forcing.

Gen. Joseph B. Brown, U.S.A.

A SIMPLE AND INEXPENSIVE HELIOSTAT FOR PHOTO-MICROGRAPHIC PURPOSES.

Probably all owners of microscopes who make photographs with them have a longing at times for a heliostat. The cheapest one of which I have any knowledge is a very expensive thing, and is not a very accurately running one, requiring adjustment for every exposure. The writer having a microscope, wanting a heliostat, and not being inclined to pay a hundred dollars more or less for one, designed and made one himself. The total outlay for the necessary materials was $6.50. A brief description of it may be interesting to some of the readers of the Annual.



Side elevation.
Section through second mirror and blue cell.

Rear end elevation.

A is a piece of plank one and a half inches thick, and of sufficient width and length to form a support for the microscope and camera, and the different parts of the heliostat as shown. *D* is a "Cheshire" clock not made now, but any of the cheap nickel-plated clocks of small size costing from $1.00 to $2.00 will answer just as well. The hands and the glass over the dial are discarded, the shaft carrying the minute hand is provided with a spur gear, *E*, having six teeth; this drives one, *F*, having 144 teeth, which is on the lower end of the small shaft running up through the inclined stand, *C*. On the upper end of this shaft is a forked piece, *I*, which forms a support for a plate-glass mirror, *H*, free to swing vertically on conical ended screws at *R*, in each end of the piece *I*. This is necessary on account of the varying altitude of the sun from day to day. It is essential that the reflecting surface of this mirror be on a line with the centers of the conical screws supporting it.

This part of the apparatus is supported by the casting, *B*, bolted to the base, *A*. The angle which this shaft must make with the base, which should be truly horizontal, is equal to the latitude of the place where the instrument is used, it being essential that the direction of the axis of the shaft should coincide with that of the axis of the earth. The vertical inclination may be fixed by means of a wooden triangle of the proper angle applied to the upper side of the stand, *C*, and a small spirit level.

J is a second mirror, longer and wider than *H*, supported as shown, the sole use of which is to receive the rays from the first mirror and throw them in a horizontal direction through the blue cell and microscope. It should be at such a height that the center of the bundle of rays will be the same height above top of base as the center of the microscope tube when the latter is in a horizontal position.

To set the axis of the shaft carrying the mirror, *H*, on the meridian, three things are essential. The longitude of the place must be accurately known, the amount which the sun is *fast* or *slow*, on the particular day on which the observation is made must be known, and the observer must have the correct time. To illustrate the process of finding the meridian I cannot do better than to describe the way I did it myself, anyone else doing it simply changing the figures to suit the location and time.

I resided in Hartford, Conn., at the time the heliostat was made. The latitude of Hartford being 41 deg. 45 min. 59 sec. N., the shaft was set at an angle with a horizontal line of 41 deg. 45 min., which was close enough.

The longitude of Hartford is 72 deg. 40 min. 45 sec. W, making solar time there nine minutes and seventeen seconds faster than Eastern standard time used there. The day selected to fix the line was the 10th of May, 1887, the sun on that day being three minutes and forty-four seconds fast, so the total allowance to be made was thirteen minutes and one second.

A plumb bob, hung from the top of the window where the heliostat was to be used, threw its shadow on the floor, so that it could be easily marked.

At exactly thirteen minutes before twelve, Eastern standard time, the position of the shadow of the bob was marked on the floor, and a line drawn through its center, and the point at the top of the window gave the meridian.

Being set up properly in a south window, the clock being wound up and started, the mirror, *H*, being properly adjusted for time and declination, it is evident that it will follow the apparent motion of the sun and the rays will be constantly reflected in the same direction.

The instrument was set up on the lines found as described above, the beam of light thrown on the opposite wall of the room twelve feet away, and its total deviation from nine A. M. to three P. M. was but one-quarter of an inch.

H. F. Smith.

SALT AS A HYPO ELIMINATOR.

Noticing in a recent number of *The Photographic Times*,* the recommendation by Dr. Stolze, of common salt as an eliminator of hypo, it struck me as very doubtful if the efficiency as such an agent can be established by facts. On the contrary I am quite certain it can be shown to retard rather than to hasten the removal of the hypo.

The best way to settle this question will be to wash two equal lots of prints side by side in equal quantities each of salt and fresh water, changed the same number of times. When it is presumed that one of the lots has been sufficiently washed, one or more prints should be taken from each lot and carefully tested for hypo. In this test it will not be safe to trust to the indications obtained from the water. There may be hypo in the plain water, and none in the salt water, while the prints in the latter may, and probably will, retain more than those in the former. I intend to make this decisive test at the earliest convenient opportunity, but at present will only describe some experiments with salt. water, and hypo in *dialysis*, which appear to have a decided bearing on the subject. On adding a solution of common salt to one of hypo no chemical change takes place in either salt; a more soluble double salt is not formed; the solution is a simple mixture in which neither excludes, or precipitates, or otherwise interferes with the other. There is not the least doubt then, that if salt does force the hypo out of the print it must accomplish this end by means of dialysis. Hence the experiments to be described ought to demonstrate that fact if it be a fact accomplished, or if the contrary be true, they ought to prove that the end cannot be brought about by this means.

To construct a simple apparatus for the purpose in hand I take a wide mouth bottle, and having removed the bottom, and ground off the sharp edges of the glass, I stretch a suitable animal membrane over the bottom (i. e. where the bottom was), gathering the skin around the body of the bottle and tying it tightly with a cord around the neck.

If the bottle be now filled with water and placed in a larger vessel, an evaporating dish, for instance, the water will slowly pass through the membrane from the bottle into the dish until it is of equal height in both vessels.

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*Photographic Times, July 19, 1889. p. 352.

Now, instead of water I take a ten per cent solution of common salt and fill the bottle two thirds full this time, for if the salt prove to have great avidity for water, the solution may rise in the bottle instead of falling. The outer vessel is filled with water to half the heighth of the solution in the bottle. A flat cork floating on this solution carries an index, which being marked on a level with the top of the bottle, will show any variation which may take place in the height of the solution. After standing twenty-four hours, not the slightest change in the height of the salt solution was perceptible, and only a trace of salt had found its way through the septum.

Next the water and solution changed places, the water in the bottle being twice the height of the salt solution in the outer vessel. After another twenty-four hours the water in the bottle stood at the same level as the salt solution in the former experiment, neither the one nor the other having fallen or risen during the time.

We now begin, I think, to see the rôle which salt plays in dialysis—it will neither go through the septum itself nor let any thing else go through—at most only sparingly.

But let us not be too premature with our conclusion. It may behave differently at the critical moment. Provide the proper object on which to exercise its potency. When it comes to displacing hypo from its lurking place on the other side of the septum, it may perform wonders. Let us see.

I now empty out the contents of the bottle and measure into it the same bulk of a fresh twenty-five per cent solution of hypo, replace it in the ten per cent salt solution and await developments. After seventeen hours I take out the bottle with its contents, whatever they are, stir the solution in the outer vessel, probably now strongly impregnated with eliminated hypo, and test it for the same. What do you think I find, oh ye of saline faith?

About one-tenth of a grain of hypo to the ounce of salt solution. Inside the bottle a hundred grains and more to the ounce of water. This it becoming interesting. What is the matter? Is the septum impervious to hypo?

Let us empty out the salt solution from the outside dish and substitute fresh water in its place. But hold, while the bottle has been standing by itself—a few minutes only—half the hypo has leaked out. This vindicates the reputation of my septum. So much the better. There is enough left. So I replace the bottle with the remaining portion in the water and in ten minutes test *that* for hypo and find that ten times as much has been eliminated into the fresh water from the bottle as was so eliminated into the salt water in the whole seventeen hours all told. From which it appears that plain water alone has the ability to extract the hypo solution through a septum a thousand times more rapidly than a ten per cent solution of salt.

Now, if after all, it turns out that the hypo in the prints is more rapidly drawn out from them when submerged in brine than when in plain water, it will indeed be surprising.

Since writing the above, I have made the experiment with prints as suggested—fairly and thoroughly, and as expected find it to prove unequivocally that salt in the water in which prints containing hypo are immersed, seriously prevents the removal of the latter. *W. H. Sherman.*

SOME EXPERIENCE IN PHOTOGRAPHING STEAMSHIPS.

Photographing fast steamers from a small boat, on the open sea, is a very difficult operation, the perplexities of which can, to a great extent, be overcome by pluck and perseverance. Often in the ordinary course of business I have been called upon to photograph steamers before they were sent on their maiden voyage, and rarely with any chance of finding a good position for the purpose, owing to the crowded state of the docks or river. The picture of a ship with numerous others behind, with their forest of poles, spars, and rigging, looks confused and mixed up, producing a very unsatisfactory photograph, and one not at all likely to please. If you want to have the vessel moved a few feet into a more suitable position, you are treated as if you wanted the world moved, and are subjected to a large amount of abuse from self-important underlings.

It was owing to these and other annoyances, that I tried to overcome this unsatisfactory state of affairs, by photographing these steamers after they had left the dock, and were out in the open sea. The great length of many steamers, renders it difficult to get the ends and centre equally in focus, unless by using a small stop which you can seldom do, especially if large work is being attempted. If you use a medium sized stop, and nicely divide the focus between the middle and the ends, you get a picture practically in focus, and with good definition.

If the light be good and there is not too much sea on, I usually get the best result by using a rapid rectilinear lens, working at *F* 13, on the quickest plate I can get, and unless handicapped by dull weather, the result is usually satisfactory. If bad weather prevails at the time it is better not to attempt anything for the chances of disappointment are great. I have had good results when the sea has been very rough, but with the light good and a clear atmosphere, the trick then is, to aim at the ship, and expose like lightning. I may mention that I do not use a finder, but I never miss, and get the picture "off the plate." How do I manage? I raise the camera a little in front, then find some object as near the centre of the vessel to be photographed as can be gauged with the eye. Having fixed on a spot, focused, set the shutter, drawn the slide and found something solid to stand upon, so as to be able to look over the top of the camera, and get a clear view of the ship, I next sight along the right hand top corner of camera, until the milled screw (used for extending bellows) and corner of camera front, and the spot on the steamer previously fixed on are in a line, then immediately release the shutter. I never find this plan to fail, but often have got a good broadside view of a steamer, 12 inches long, on the centre of a 15x12 plate, with a good balance of sea and sky. It is really surprising what one can do when compelled to try; many times I have succeeded in obtaining a negative of a steamer, which has given satisfaction, and secured a good order, when previously I have failed in the attempt to photograph in the harbor a new vessel of importance or of a new type, which the owners or builders wished to have photographed. I get orders to attend on the day of the trial trip, when everything is in readiness, and the vessel can be put in any desired position so as to have the light in the right direction, I can move forward or backwards or go around without interfering with, or being snubbed by dock officials. Very often, including the journey out and in again, less time is lost. Although I have had to remain out all day at times, nevertheless, I prefer doing the work at sea.

Fast cruisers doing their speed trials are a greater "trial" to the photographer than a merchant steamer; they usually go through the water at the rate of 18 or 20 knots, and it is no easy matter to get a good broadside view when they are moving at a such a high speed; foreshortened bow or stern views are of little value (except from an artistic point), as the designer and builders of the vessel want to show the water line along the whole length of the ship. To make photographs for scientific purposes my method is the same, the work more precarious, and more failures are to be expected; still, it is a most interesting branch of photography, the good results amply repaying whatever trouble, anxiety or hardship one must encounter. *W. Parry.*

TRUE ECONOMY.

The photographic problem at this time of improving work and decreasing prices, is, how to get the best results in photography with the least cost, and with a view to pointing out some of the best methods of doing this, I beg to submit the following hints:

In the first place the negative comes into consideration. To produce a good negative a good dry-plate must be used. Find out what makes of dry-plates are most used, and from the number select that one which will make a good negative with the least outlay of time, developing material, and patience. The quality of the plate is of the first importance, afterwards the price. A good plate will be fast enough for all gallery purposes, after that speed is attained at the loss of other valuable qualities. Then a good plate should develop rapidly when properly exposed, and when developed should fix easily and quickly, giving a negative with the same effects of light and shade as were observed when the subject was posed and lighted. This is of importance, for the reason that some plates will not reproduce the same balance of lights and shades that were observed at the time the sitting was made. The negative being developed, do not hurry it out of the fixing solution, its keeping qualities are dependent on being thoroughly cleared more than on thoroughly washed after fixing, although this latter is of no small importance. In the development of plates economy may be greatly subserved by using a good formula for quinol development, a formula that I have heretofore recommended, when properly compounded, will develop one 5x7 plate for every grain of quinol in the solution, and give excellent qualities when certain brands of plates are used—it will not do it with all. This gives three hundred plates and upwards from one ounce of quinol when few get more than 75 from one ounce of pyro.

The negatives being made and prepared for printing, the preparation of the paper for that operation becomes of importance.

I give the preference to a plain silver solution kept in a neutral state by the addition from time to time of a pinch of bicarbonate of soda, enough to leave a trace of sediment in the bottom of the bottle, and kept at a strength of from 40 degrees of the hydrometer in hot weather, to 60 or even 70 degrees in cold.

I recognize the necessity for filtering this solution every day, decanting it into the silvering tray, leaving the sediment in the bottle, and if necessary skimming the top with a piece of tissue paper to remove particles of dust that may float.

The paper should be left on the solution *only* until it lies flat, then it should be slowly lifted and hung up to dry. This operation (sensitizing the paper) will rarely take a minute, and is often completed in thirty seconds. After the paper has straightened out flat on the solution it should be removed, any delay after that is only detrimental to the finished work.

Fuming may be done while the paper is still damp, or not quite dry, but the paper should be thoroughly dried after fuming.

Following this plan we are using less silver, and we have it when it does the most good on the surface of the paper.

The prints should be well washed so that all free silver is removed in order that as little gold may be used in the toning as possible.

I discover no advantage in the use of acetic acid in the first washing of prints, instead, I find that it delays the toning. I use salt in the toning solution, enough to redden the prints when first immersed. The change of color as the toning proceeds is plainly noted, and the resulting tones are usually velvety soft, and very bright.

The operations thus described are those in which economy may be practiced greatly to the advantage of the work in other directions. Perhaps it is not so desirable to be saving.

E. M. Estabrooke.

DRYING NEGATIVES AND CLEANING THEM.

Drying Negatives.—The directions for drying negatives generally enclosed with dry plates, recommend spontaneous drying. The reason for this is that the drying is accomplished with almost no risk, whereas heat is liable to produce spots in the negative of varying density, with other defects, *while more or less intensification* usually results. If the negative is thin no harm will ensue from the increased intensity, but if it is already dense enough it should be allowed to dry spontaneously. Alcohol is recommended as a bath for negatives previous to drying by heat, but has not always proved successful with the writer. Spontaneous drying is the surest, but the following method is speedy and also safe if the directions are followed:

After fixing and washing bathe the plate in a saturated solution of common alum, to ten parts of which has been added one part of a saturated solution of chrome alum. (It is quite necessary to use a similar bath after development and before fixing unless alum is used in the "hypo."). After soaking in the alum bath for five minutes, take out the negative, rinse in clean water, and blot off the superfluous moisture with *good* blotting paper or an old linen towel. If fragments of lint cling to the film, *wait until the negative is dry* and then remove with camel hair duster, or *carefully* rub with a piece of chamois skin, or else hold film-side down over the chimney of a lighted lamp and singe off the lint (being careful not to smoke the film), and then brush off with the duster if necessary.

After blotting off the moisture dry in steady heat, which will take from five to ten minutes, perhaps less time. Using the bright sunlight to dry the negatives answers well, more especially in the summer time.

CLEANING BACK OF NEGATIVE.—Usually alcohol is used, but this is more expensive, and is not, in my opinion, quite so effective as pulverized pumice stone, which does the cleaning to perfection. Apply with small rag and then dust off with a larger one. This will take off finger-marks, stray dabs of emulsion, in fact, stains of all kinds that adhere to the glass, and also streaks of varnish which may have gotten on the wrong side of negative. *W. H. Gardner.*

NEW FORMS OF LONG FOCUS LENSES.

OF late two or three new forms of landscape lenses have been introduced in England that may be classed under the head of "long focus" lenses. I do not know whether these or similar lenses have found any great popularity in America, but I have seen nothing in the photographic press to indicate that they have. There can be no doubt, however, that they will before long, and perhaps a word or two as to what really are the qualities which distinguish these lenses from others may not be out of place here, and may possibly be of use to some. The term "long focus," although very generally used, and although by no means a bad term, if properly understood, is, nevertheless, somewhat of a misnomer, for really a lens is not long focus or short focus according to *form* at all, but merely according to the actual measured length of focus, and even then the "length" or "shortness" is only comparative.

What, then, is the real meaning of "long focus" in this particular case? It really means a lens which, whatever may be its actual focal length, will only cover a comparatively small plate. It may here appear, at first sight, that we have merely a limitation that cannot possibly be an advantage, that it could not do any harm if the lens were at least capable of covering a comparatively large plate. This is, however, not quite the case. There are various advantages in a lens that cannot be used to cover a large plate, whether the owner wishes to cover a large plate or not. One of the first, and indeed perhaps the chief of these, is that the optician, not having to consider the correction of very oblique pencils of light is able to introduce more perfect correction of those that remain. Thus, if only an angle of between 30 degrees and 40 degrees has to be included, better correction of spherical and achromatic aberration can be obtained, with the result that the maximum aperture may be increased, and, moreover, somewhat greater flatness of field can be introduced. But another advantage, as put by Dr. P. H. Emerson, is that such a lens "cannot be so ignorantly employed as can lenses of shorter focus." This statement, which is perfectly sound, has, to my knowledge, been very much misunderstood in some cases, and needs a little explanation. In the first place, the term "short focus" is here used in a similar sense to that in which I have used the term "long focus" above, not necessarily meaning absolute shortness of focus, but describing lenses capable of covering plates large as measured by the focal length of the lens. It has now been very often pointed out that there is great danger from the ignorant use of such lenses. The opticians themselves are in many cases responsible for this, from the habit that they have of describing lenses as "half-plate lenses," "whole plate lenses," "12 by 10 lenses," and so forth, an ignorant worker thinking that because they are so named they must be used for the size of plates indicated, or at least ought to be so used, and therefore falling into the mistake of including a wider angle than is in accordance with the dictates of art. Now, with the "long focus" lenses it is not possible to include more than a comparatively narrow angle, and the exaggerated perspective that spoils so many photographs that would otherwise be good is avoided of necessity.

It has always seemed to me that since its great rapidity is no longer a thing of necessity, the greatest advantage of the portrait lens is that it cannot be used to include any but a very limited angle. It is quite possible, with, for example, some forms of single lens, to take a cabinet portrait that will be quite as good as is needed, so far as definition is concerned, with a focus of, say, seven inches. Such a portrait will be in outrageous perspective, but the photographer who uses a portrait lens is perforce prevented from producing such distortion, simply because a portrait lens of seven inches equivalent focus will not "look at" a half plate. The equivalent focus will be at least 10 inches, more probably 12.

I remember very well pointing out, some seven or eight years ago, that the actual distortion produced by a single lens was so slight through a moderate angle as to be practically *nil*, and that this distortion did not in any way incapacitate such a lens for portraiture. I assumed that, if a single lens were used for the purpose indicated it would be used of as great focus as that of a portrait lens commonly used to cover the same plate. Very shortly after I had made the above mentioned statement, a photographer brought a portrait to the London Photographic Club to prove that what I said was wrong. It was taken with a single lens and was certainly an abortion. "Therefore," argued the photographer, "the statement that the distortion peculiar to a single lens might be left out of consideration in the case of portraiture was a mistake."

The portrait was, if I remember rightly, on a plate 10 by 8, and, on inquiry, it turned out that the focus of the lens was only about 10 inches. I pointed out that the fault in the portrait was not in any way, or at least not chiefly, due to the distortion peculiar to the single lens, but would have been equally apparent had the lens been absolutely rectilinear, and that it was merely the exaggerated perspective due to the use of too short a focus lens, and that it would be necessary to use a lens of at least some 16-inch focus—better 20 inches—to avoid it. "But," replied the photographer, "this is a 10 by 8 lens!" I gave up all attempts at further explanation after that.

But, if the so-called "long focus" lens has certain distinct advantages, it must be understood that the idea that some appear to entertain, that there is some peculiar virtue in it giving "more correct drawing" than is given by other lenses of the same measured focal length, but not of the "long focus" form, as defined above, is a complete delusion. It should be distinctly understood that, leaving actual distortion out of the question, all lenses of the same focal length will give precisely the same "drawing," one as the other. Moreover, it may be taken that, if the focus is really "long" by measurement, say, if it is not less than twice the length of the larger dimension of the plate, actual distortion may be left out of consideration in all cases excepting such as the copying of maps. I do not only mean that it will be so slight as not to be conspicuous, I mean that it will be so slight that it will be barely detectable by measurement other than the very most delicate. To take an example, let us suppose that we have two lenses of exactly the same focal length, say about 20 inches, one of the old-fashioned type of "single lens," the other a rectilinear, and that we take a 12 by 10 negative with each of them, not only will it be impossible to tell by mere inspection which has been taken with the "distorting" lens, and which with the rectilinear, but it will be difficult to find any difference between the form of one image and the other with any means of measurement less delicate than a pair of fine dividers.

As a matter of fact, then, if we only use a lens having by actual measurement a long focus, as compared with the size of the plate, we will get the same results, so far as drawing is concerned, whether the lens be of the rectilinear type, of the old-fashioned single type, or of one of the new so-called "long focus" types. The chief difference between the old-fashioned single type, and the new "long focus" type—which, by the way, are also single lenses—is that the latter are less cumbrous, allow of the use of a larger aperture—and are, therefore, of course, more rapid—and have a flatter field and generally less astigmatism than the other.

At the beginning of the latest International Annual, there are two pictures that show admirably the difference in effect produced by the use of a lens of long focus, and one of short focus. One is taken with a "Long Focus Rapid Landscape Lens," the other with a "Wide-Angle Landscape Lens." The difference is very great, the photograph taken with the long focus lens being much the better picture of the two, *but the difference is not due in any way to the difference in form of the two lenses.* There would have been precisely the same difference had a Wide-Angle Landscape Lens been used in both cases, one of the same focal length as the "Long Focus Rapid Landscape Lens" used for the first of the two pictures. On the other hand, a "Long Focus Rapid Landscape Lens" *could not have been used* to produce the second picture, inasmuch as a lens of such form, if of focus short enough to give the smaller scale would simply not have covered the plate.

Copied from
Meissonier painting.

"AT THE BARRACKS."

"LA PATROUILLE."

William Kurtz, N. Y.

I repeat that one of the chief advantages of the new "long focus" forms of lens is that it makes the false drawing produced by the including of too wide an angle impossible.

W. K. Burton.

ARCHITECTURAL PHOTOGRAPHY.

The most important aid which photography has given to art has been in its reproduction of the works of art which have come down to us from ages more favorable to their production than ours. And it is especially the case with the representation of monuments of architecture, for pictures may be, and are, faithfully copied, but no patience of man can ever succeed in putting in black and white the stupendous works of the great epochs of architectural evolution, the enormous masses of the great Gothic cathedrals with all their exquisite elaboration of ornament, the subordination of the infinity of detail to the mass, giving the simplicity and breadth, with inexhaustible modulation of surface, which is the characteristic of great art; or the severe chasteness of the Greek temples with their subtle inflections of the main lines, their curious ocular illusions, and the majestic symmetry which is one of the noblest elements of composition. The best work of the greatest architectural draughtsman can only achieve an approximation to the correctness of perspective, the fulness of detail, the accuracy of the curvature and the complete subordination of the detail to the general effect, of a well made photograph.

We seem to have come to an age in which, if nothing original in architecture appear (for the iron-and-glass Crystal Palace sort of thing cannot be called either art or architecture, though it may be good building) we have at least more taste in adaptation of the old and a better appreciation of the merits and peculiarities of the different styles, and are able by means of photography to bring together into intimate comparison the different epochs; and the architect of to-day has the ability to put side by side the transcripts of all the buildings that can offer him suggestions. With a good collection of photographs an architect makes the range of the entire architectural world and of all ages with an accuracy and fullness of observation utterly impossible before the application of photography.

Yet in my own personal experience of collecting there is no class of subjects so inadequately rendered, and it sometimes happens that even with professional architects who are amateur photographers the photograph lacks the precision which science requires. For the photograph is by no means necessarily correct, the kinds of error which can be introduced intentionally, and which are to a certain extent sometimes introduced from ignorance, are worse than anything which was ever seen in the work of a draughtsman who understood the rules of perspective. And to make this clear to a way-faring photographer who is, so far as perspective is concerned, ignorant, so that he shall no longer err therein, it is necessary to say something about the perspective of the camera. There is a common error afloat on this subject that the perspective of wide-angle lenses is incorrect through exaggeration. The single or so-called landscape combination is incorrect always whether it be wide-angle or not, but the rectilinear lenses give an image which in all cases of proper usage is exactly coincident with that of a correct perspective drawing *i. e.* one in which the rules of scientific perspective are precisely observed. The wide-angle lens exaggerates only the field of vision and shows us more than we are in the habit of seeing in a single view but that it is scientifically correct can be shown by two experiments. The first is to take a sheet of glass framed and fitted with an eye-piece, the distance of which from the plane of the glass is in proportion to the length of the base line of the glass, as is that of the focal distance of the lens to the base line of the photograph; and trace on the glass the view of any building as it is seen through the eye-piece, the precaution being taken to keep the perpendicular of the glass correctly. If you compare this drawing with the corresponding photograph they will be found to agree in all respects. The second is to take any view from the same point with a wide-angle and a narrow-angle rectilinear lens, and then enlarge the portion of the view that is seen on the wide-angle, until it is of the identical dimensions with the narrow-angle view, and they will be found to agree. The way in which a horizontal circle such as the upper edge of the capital of a column will seem to be distorted when seen at the side of the view in a wide-angle photograph, puzzles the careless observer who can understand that a circle seen foreshortened becomes an oval, but not how it can become an ovoid such as the photograph makes it. Yet this is correct for the circle seen horizontally and at the side, becomes subject to a double distortion the result of which is this particular ovoid. That it does not look natural to us is only the proof that our vision is untrained to the perception of perspective facts. For we all more or less see things as we think or know they are. The perception of light and shade and its effect on local color is a matter of education—none of the early schools of art noticed it and it is not an element in the Chinese and Japanese art of to-day. So of perspective.

But this rectilinear perspective is to a certain extent, or in a certain sense, conventional; it is only really in agreement with the actual appearance of things when we see the picture from the distance at which it would cover the view. If, for illustration, I look at a photograph taken with a lens of 15 in. focus, I must look at it from the distance of 15 inches from the centre of the photograph, when the diminution of the objects at the extremes of the picture, in consequence of the difference in distance, agrees exactly with that in the actual view, which can be mathematically proved if it were necessary, but at present the reader must take it on faith. But when we look at a photograph taken with a 6 in. lens at a distance of 3 feet, the absolute coincidence no longer exists. The upper and lower edges of a parallelogram, seen perpendicularly to its plane, as for instance the wall of a room seen from the middle of the opposite wall, do not appear to be straight lines though we know that they are, for they evidently converge to the right and left. But if drawn so they become curves and will not seem correct, for we know they are straight lines. If we take a long façade with the rectilinear lens the horizontal lines are straight as they are in the building, but it is clear that the extreme columns, being further from the eye than the central ones, must seem shorter, as in fact they do, but the same thing is true of the drawing or photograph unless we curve it so that all parts shall be equally distant from the eye. If on the other hand we take the same façade with the Pantoscopic camera which admits the view through a narrow slit and revolves so as to give the façade throughout with the same focal distance *i. e.* as it is seen by the eye when we turn the head, the extreme columns are shorter, in proportion to their distance from the lens of the eye. But this we all agree to reject as correct photography for though the theoretical perspective is subject to a certain incorrectness, it is trivial in comparison to that which the Pantoscopic produces.

Therefore we adopt the rectilinear perspective as giving facts in a manner which can be made to agree with actual vision and are at the same time scientifically correct. But that they should be so it is necessary to use mathematical exactitude in the operation of taking the view. As we all know, if the camera is pitched forward a little it will produce an upward divergence of parallel perpendicular lines, if thrown back it produces a downward divergence, or a pitching together of the perpendiculars, which is an absolute and evident falsehood, while if one side of the camera back, being perpendicular, is swung back it makes the lines on the side furthest from the lens longer relatively than on the nearer; which is another, though less apparent, falsehood.

Now let us see the practical consequences of these errors in the photograph when we come to architectural photography. Suppose we have to take a Gothic tower or a Venetian campanile [not pronounced *campaneil* but *campaneeley*] which has a slight taper upwards; it is important from the architectural point of view that this taper shall be correctly indicated but if the photographer is a little careless he may make it without taper, or with a taper the other way in fact, or he may exaggerate the taper. In the taking of Greek temples it is still worse, for the system of curvatures and inclinations of the main lines is exceedingly complicated. In the first place the columns have a taper and a curve in the profile at the same time; they do not stand perpendicularly but with a little inclination inwards so that if they were prolonged sufficiently they would meet at a point in the air at a certain height above the centre of the temple. If you go into a photographic establishment in Athens you will not find a single photograph which is correctly taken. They invariably tilt the camera back so as to get the top of the buildings in from a nearer point of view than they otherwise could.

The most important precaution to take, then, in placing the camera is to have the plate, or film,[*] absolutely perpendicular, and the next is that the sides of the plate shall be at exactly the same distance from the lens; in default of which the lateral symmetry or proportion is disturbed. I have found the use of a plumb line indispensible for the former; and for the latter a carefully graduated scale on each side of the camera bed, if it has a side swing, which many landscape photographers consider indispensable. I have very rarely found it of any use whatever, but tastes differ. It will be seen from what I have said that the construction of the camera is of the greatest importance and the fitting of the focusing screen should be in a groove and not by a hinge, the same goove that takes the plate-holder. The swing-back is of course indispensable but the double swing is a nuisance and had better be avoided; the fewer are the motions of the parts with each other, the better. The back should be "reversible" and held by four solid and carefully adjusted hooks at the corners into a "rabbet." The edge of the frame of the focusing screen should be *exactly* parallel with the plane of the screen so that the plumb line (a conical pistol bullet at the end of a piece of black saddler's silk I have found to be the most efficient) will show the pitch in both directions. For this adjustment a ball and socket swing in the tripod with a strong clamp is very advantageous. The tripod must not be too light.

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[*] For the past few years I use only the American film and on a recent trip in Sicily I took the precaution to repeat my exposures, and in difficult cases even made a third of the subject, with exposures of 5, 10 and 15 seconds with $\frac{f}{100}$ and then I sent the rolls to London to be developed while I kept on my journey, and not one of my negatives was spoiled from defect in the exposure, and of most of them the negatives can hardly be distinguished one from the other, while not a single subject was lost and only two or three of those I sent to London to be developed were defective, while those which I undertook to develop myself on the journey were almost all spoiled, from the difficulty of stripping or inconveniences in developing. I had in fact to give up developing even my 4 x 5 negatives abroad. I sent the rolls by letter post and received supplies of film at a cost which was less than the sending of plates by express. This makes the use of a film for people who wish to do photography in remote and difficult journeys, of an incalculable advantage. I have never taken a series of views of the same size (8x10) of such average excellence and freedom from defects, as this Sicilian series.

In selecting the view of an important building it is well to remember that the most picturesque is not always the most valuable. The most important view of a building is generally its façade or principal front. This in a Greek temple gives an absolutely symmetrical view and the point of sight is easily found by the range of the front and rear central pair of columns. In a Gothic cathedral it is not so easy to find, but if you have scratched on the focusing screen a series of horizontal lines, the parallelism of one of them with the main horizontal line of the façade will show that you are opposite the centre of the façade. The flank, or long side, comes next, and then the picturesque views, of which the most interesting will generally be the one which shows the front with a partial view of the side. Focus on the most important part of the subject and then stop down to the smallest stop you have—I use $\frac{F}{100}$—and then if you want to have your negative enlarged the loss of sharpness in the detail cannot be felt. Give full exposures so that no detail in the shadows shall be lacking. A figure introduced into the view in such a way as to give a comparative idea of the size of the building is of great value. Details of ornamentation with a long focus lens are always of value, especially in Gothic and Byzantine work, the capitals of columns, single windows, doors, &c.; and it pays sometimes to get access to a house opposite the church so as to get the view without the bother of the crowd of block-heads who always think that there is some mystery to be discovered in the camera and get square in front to see it come out.

The getting of interior views is a matter sometimes of extreme difficulty. There is not light enough generally to focus the camera properly, and often not enough to see the subject on the screen. I have the focusing distances of the series of "Portable Rectilinears," which I find indispensable to use for good architectural work, all scratched on the camera bed for objects at a distance of 30 feet, 150 feet and for the horizon or extreme distance, and on the top of my camera I have a finder with a large lens which will give an image even in a feeble light and on the ground glass of which I can have the field of each lens shown by lines of ink so that I can see in the finder the view given by either of the lenses. It will be seen at once that the camera which has but one focusing movement is the best, for with a double movement the register of focal distances on the bed of the camera becomes uncertain. I am therefore to a certain extent independent of the focusing screen and if mine becomes broken I can always get my subject on the film or glass as well as if I saw it on the screen. Here the plumb line shows its superiority over the circular level which is recommended for getting the position of the camera and in this particular case a thread of white silk is preferable to the black used for outside views. Another simple device may be of use to the inexperienced. If your tripod is shod with steel points you will find it sometimes very difficult to get it to stand in the position you may put it in. If you carry in your pocket three good sized corks which you can stick on the points you will find no slip, even on polished marble floors, and the adhesion is still more complete if the corks are wet.

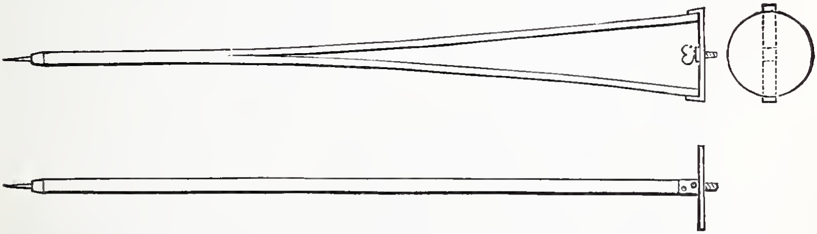
If you go about much amongst Gothic churches in Europe you will probably not be long in finding out that a permission to photograph from the police authorities is necessary and that it will sometimes help you to keep the undesirable assistants out of the foreground.

One thing is of such vital importance that without proper attention to it I consider no architectural photograph worth giving away or accepting, *i. e.* a clean sky without painting out. If I make a negative in all other respects absolutely perfect and the sky requires painting out, I destroy the negative, for an architectural photograph in which the outline has been tampered with by any hand-work has lost all its scientific value. In *any* case the painting out of the sky is a bungling and unartistic expedient; but in architectural work it is fatal.

W. J. Stillman.

A UNIPOD.

Being desirous of participating in the photographic festivities of the naval parade in New York during the recent Washington Centennial celebration, and rightly surmising that the steamer chartered by the Society of Amateur Photographers of New York would scarcely afford the needed space in which to place the ordinary camera stand or tripod, I concluded to experiment with a support made of a single piece which would carry my 6½x4¾ Hare camera in such a way as to give it sufficient steadiness, admit of rapid adjustment to the plane of the objects to be photographed, and yet occupy but little floor space. The outcome of this was what I call a unipod, or as a friend facetiously remarked, a "one-legged tripod." It was made of two pieces of one inch by one-half inch white pine, each four feet four inches long, joined together at the lower end to form a square and spread apart at the upper end to fit a brass plate three inches in diameter, through which the usual clamping screw penetrated to bind the camera. At the lower end was placed a sharp steel point to prevent sliding when standing on a smooth surface. It will readily be seen that by holding this stand in the left hand, and having its height so adjusted as to bring the finder on a level with the eye, the camera could be rapidly brought to bear upon and take in any moving object. When this was accomplished, as evidenced by the finder, the exposure was made by means of a pneumatic bulb held in the right hand. A little practice is all that is necessary to enable one to adjust the camera to the desired field of view with the utmost precision. I am convinced that such an instrument whether made in the manner just described or



of the form of a cane or alpenstock would be invaluable with detective cameras, and tend in a measure to obviate much of the distortion, due to careless or hurried adjustment, common in pictures made with cameras which are held in the hand. I have found when making street views, and using the unipod, that aided by a circular spirit level attached to the camera, it was possible to level the camera much more readily than with a tripod, and at the same time to avoid all risk of jarring caused by a curious, careless passer by.

C. R. Pancoast.

TONING ARISTO PRINTS WITH PLATINUM.

About two years ago while I was trying to find a suitable toning bath for Liesegang's aristotype paper (at that time the only good paper of the kind in the market), it occurred to me to try some platinum chloride instead of gold salt in the toning bath, not because my results with the gold did not satisfy me, but for the sake of experiment. I need hardly mention that my experiments were unsuccessful, the toning was an utter failure, for instead of toning the prints, the platinum bath to my great discomfiture, bleached them completely, making them absolutely useless. I wasn't hunting for a bleacher though; and as I soon saw into my mistake of supposing that I could substitute platinum chloride for gold chloride, I gave up the idea for the time being, and until March last always used the phosphate of soda gold bath for toning purposes.

In March though, while developing some of Willis's platinum paper (cold process) and considering the chemical process which was taking place, I reasoned by analogy that a similar developer as used for Willis's "Platinum Cold Process" must be a platinum toning bath for aristo paper. I quickly threw aside my platinum prints, in order to renew my old experiments, and surely enough, they were crowned with success. The platinum toning bath was found. The vital point lay in the fact that instead of using platinum chloride, a salt which contains a superabundance of free hydrochloric acid, as formerly, I now used potassio-platinous chloride which contains but little free acid.

The two following toning baths have been used by me with excellent results:

I.

a.	Potassium oxalate	3½ ounces
	Potassium phosphate	1¾ ounces
	Distilled water	1 quart

b.	Potassio-platinous chloride	15 grains
	Distilled water	6 drams

To tone, mix 6 volumes of *a* with 1 volume of *b*.

II.

Potassium-platinous chloride	15 grains
Distilled water	1 quart
Nitric acid, conc	25 minims

Before toning, the prints are washed in the usual way, and then put in the toning bath for about 10 minutes, and are afterwards *thoroughly* washed again, so that the high lights (whites) do not become yellow in the fixing bath. The alum bath is hardly necessary; if used, it should come in after toning.

The tones acquired in these baths vary from light brown to black, the tone, of course, depending upon the length of time the print is left in the platinum solution.

Aristotypes toned with platinum are given a matt surface by squeegeeing them upon clean ground glass, and letting them dry in the vicinity of a fire or in the sun. The matt surface enhances the artistic value of the picture greatly. Before closing I wish to remark that I have by no means thrown the gold bath overboard; on the contrary, I use it quite as frequently as the platinum, the choice depending upon the ultimate effect through toning that I wish to produce. *Effect* is the great thing in photographs of any artistic value.

Alfred Stieglitz.

SOME PRACTICAL SUGGESTIONS NOTED FROM AN AMATEUR'S PRACTICE.

At one time or another I have tried almost every size between the quarter plate and a 10 x 12 but have now settled down to 5 x 7 and 8 x 10 as best suiting my wants. I still hold to plates, finding weight the only objection to be urged against them, which objection is I think counterbalanced by some advantages peculiar to them alone. Slow plates work so easily and with so much more brilliancy than fast ones that it is singular they are not more used. The great trouble is the unaccountable desire for rapidity, drop-shutter "off and on" work. In taking an inanimate object that cannot move if it would, why not use a slow plate, give it two to eight seconds as the case may be and then develop it in a good comfortable light into a rich, brilliant negative with plenty of density and in a few moments; instead of worrying with a lightning plate in Egyptian darkness to obtain but an indifferent negative as a reward?

After I have made a negative that suits me both as to the subject and technically, I number and catalogue it and with India ink and a moderately fine pen such as Spencerian No. 1 print both number and title along the bottom (backwards of course as the letters are reversed in printing) just far enough from the edge to allow for the rabbet of the printing frame. At first I ruled two lines lightly on the film with a lead pencil to guide me but after a little practice I found I could do with one. These lines being lightly drawn are visible by reflected light only, when the negative is lying on the table, thus avoiding the bother of a retouching frame and insuring better work as the position assumed is nearer that of ordinary writing. In lettering negatives thus do not make the letters too large for in that case they will intrude themselves upon the observer and draw away the attention from the picture.

Though not always suitable it is of great use on landscape negatives and in all cases I attach the number of the negative in this way. When lettered the negative is placed in an ordinary negative preserver which after having the usual data plainly written on its face is placed away in its proper receptacle.

Lately I have attempted stereoscopic pictures. I invested in a pair of "Waterburys" used with a partition made of a piece of ferrotype which was kept in place by cutting it a trifle too large and crowding it in between the folds of the bellows. I use a 5 x 7 plate or else make two on a 6½ x 8½. Both of these sizes give ample room and there is no necessity in my opinion of going to the expense of a 5 x 8 plate when 4¼ x 6½ will do as well. A little more care in focussing, etc., is all that is needed.

In mounting stereo views I find an easy way is to number the negative with India ink as usual on the half that is to be on the right hand side when mounted. This gives a clue as to which half is which when it comes to mounting. By printing both halves at once on the same piece of paper and not cutting until after toning, more uniformity in strength and tone is secured. In cutting out stereo prints in mounting one side is first cut out by a form cut from a spoiled plate by a wheel glass cutter. The piece cut out is laid on the other half with the form over it and thus serves as a guide to enable me to get the same view for each half. Another good way is to mark out on the negative by scratching lines with a pin the parts to be cut out, by this method the trouble of adjusting for each print is avoided.

I wish in closing to caution amateurs not to pay so much attention to extreme accuracy in compounding their developers as some do. It is common among many to attribute failure to the compounding of the developer, when it is more likely to be their fault in applying it improperly. My method which I have pursued for a long time with the greatest success is to mix up a rather strong developer of say four to six ounces bulk. Then taking the graduate I pour out one or two ounces and dilute with water to one half or one third strength. Begining with this I have full control over the development, for after starting with the weak developer I can soon tell how to compound the proper developer for that plate which I do from the strong solution already mixed up, adding more pyro, soda or bromide as may be needed. In this connection I would say that it is my regular practice to tend rather to overexposure, as much of my work cannot be repeated and by this means I avoid ever getting that most hopeless of plates to be developed, one that has been underexposed.

S. L. Walkley.

TWO HINTS.

Until recently both my pyro and alkali stock solutions were invariably filtered, but I have now discontinued the filtering of the former. I was led to this by observing that my pyro solution, when freely mixed, was clear and without color, but, after filtering there was considerable discoloration and consequent deterioration. Mentioning this fact to a friend, he suggested that owing to the affinity of pyrogallol for oxygen, as each drop filtered through it absorbed oxygen from the air, hence the discoloration and loss of strength in the pyro solution. Since this suggestion was offered I have mixed all of the chemicals of the stock solution except the pyro, filtered them, and then added the pyro. The greatly improved quality of the pyro solution is apparent. As the alkali solution is not affected by air the same precaution is not necessary with that.

Being present while the friend who gave me the above hint was developing a plate, I noticed that when he added some pyro to the developer and accidentally spilled a few drops of the solution on the plate, what looked like representations of bombshells exploding make their appearance on the plate where the drops had fallen, notwithstanding the fact that the plate was covered with developing solution. It then occurred to me that if a few drops of pyro had such a marked effect when not properly mixed with the developer, much unevenness in negatives must be due to a similar cause, and since then I have always stirred my developing solutions with a glass rod before pouring them on the plate. Previously I had simply poured the solutions one after the other into the graduate and then on the plate, but I find now that I am more than repaid for the use of the glass stirring rod.

These are small matters and apparently of slight importance, but it is only by careful attention to details through every step of the work that the best results can be obtained, and while my experience does not differ from that of others, it may be well to record it, as many are apt to overlook what should be plainly apparent to them and an occasional reminder as to the proper use of chemicals is of more benefit than giving a new developing formula or recommending the change to another brand of plates.

Frank Henry Howe.

DIRECT PHOTO-LITHOGRAPHIC PROCESS FOR COLOR PRINTING.

The necessity of introducing some system of photo-zincography by which accurate color plates could be produced for printing, success in several colors has led me to try various methods of obtaining the photographic image direct on the zinc plates, instead of transferring it from from paper prints which must always be more or less out of scale. Several methods were tried, but the following, which was worked out by Mr. J. Harrold, one of my assistants, has proved simple and efficient.

The negatives must be *reversed* and taken from as many specially drawn originals as there are colors to be reproduced, *e. g.*, one for the black outline Thames, a second for the blue streams, sea, lakes; a third for the hills in grey or brown; a fourth for details to be shown in red, and so on. It is necessary, of course, that these different drawings should be very carefully prepared so that their reproduction may agree accurately together.

The zinc used must be in thin sheets so as to secure perfect contact in the printing frame between the negative and the plate, without great pressure, which would dent the plates. The zinc plate is carefully cleaned and grained with sand as usual, then washed over with a strong solution of gum and decoction of nutgalls, such as is used for etching the zinc plates after transferring photo-transfer prints. It may be made by soaking bruised gall nuts in about twenty times their weight of cold water for twenty-four hours, then boiling down to half. The liquor is strained and about one-hundredth part of dilute phosphoric acid (made by placing plain sticks of phosphorous in water in a bottle with their ends uncovered) is added. Equal parts of this decoction and of gum water form the etching solution.

The etching solution is allowed to dry on the plate and then thoroughly washed off again. The plate being dried is then coated evenly and carefully by means of a piece of cloth folded into a long pad, with a solution of arrowroot, albumen and bichromate of potash.

ARROWROOT SOLUTION.

a.	Arrowroot	20 parts
	Bichromate of potash	9 parts
	Water	700 parts
b.	Albumen and water	Equal parts
	Solution *a*	40 parts
	Bichromate of potash	5 parts
	Solution *b*	15 parts

The coating left on the plate is exceedingly thin, so that it dries off quickly with a moderate heat in a few minutes. It is exposed under a reversed negative for about six minutes in the sun for ordinary line work. The plate is allowed to cool and then soaked in cold water for about half an hour to remove the bichromate. The exposed surface is next carefully sponged to clear all soluble colloid remaining, and after a good rinsing in clean water the plate is dried and inked with transfer ink, which is allowed to dry on for about fifteen minutes, and then washed off with turpentine. A few drops of water are sprinkled over the plate, and it is then wiped and rolled in with ordinary printing ink. The further application of the etching solution of gum and nutgalls seems unnecessary, except for cleaning the borders; but, in any case, it should not be applied till the plate has been properly rolled in.

Plates prepared in this way stand printing well and seem specially suitable for fine line work.

Col. J. Waterhouse, B.S.C.,

Assistant Surveyor-General of India.

SOME POINTS IN THE FINISHING OF PRINTS.

In choosing frames for photographs care should be taken to see that the glass is white, not greenish in color. A print that is a little too dark will sometimes look fairly well under a piece of good white glass, while the effect will be quite spoiled by commoner glass of a green color. The high lights of the picture also will suffer if placed under the common variety.

There is a beautiful method of mounting prints in which the same care as to the quality of the glass must be observed. The prints must be ordinary silver prints on albumen paper, and made a little darker than usual, but not overtoned; on the contrary, they should be rather reddish in color, not blue. Having selected pieces of good white glass, and cleaned them thoroughly, the prints are trimmed slightly smaller, and laid, together with the glass, in a warm solution of gelatine made by dissolving an ounce of refined gelatine in a pint of water. As soon as the print has become well wetted and ceases to curl, it is brought down so that the picture side touches the glass, and the whole is then lifted out of the solution and drained a moment. Now, lay it flat on a table and pass an india-rubber squeegee over the back of the print to remove the superfluous gelatine, and clean off the back of the glass with a sponge dipped in hot water. Let the print dry, and it will be found to appear very brilliant and beautiful. A frame of maroon-colored velvet suits this style of print very well, and of course no additional glass is required.

For the benefit of those who have never used the "squeegee," we will say that it is merely a strip of india-rubber, say, an eighth of an inch thick, six inches long, and an inch wide, set into a suitable wooden handle like a piece of the ordinary weather-stripping for windows. It is thus a sort of elastic scraper, and is useful to the photographer for many other purposes than the one mentioned. Ordinary weather-stripping cannot be utilized for this work, as the rubber is too thin and flexible, and passes over the little irregularities which it is the province of the squeegee to remove. *Ellerslie Wallace.*

HYDROCHINON.

During my working experiences with the hydrochinon developer made according to the following formulæ:

1.	Hydrochinon	80 grains
	Sodium sulphite	1 ounce
	Citric acid	30 grains
	Potasssum bromide	15 grains
	Water	10 ounces

2.	Sodium hydrate	80 grains
	Water	10 ounces

Equal parts of each solution.

I have found that when quite freshly made it is all that could be desired for the production of good negatives. Certainly it is slow at starting, but when the image does appear the progress is rapid, and any quantity of density can be obtained.

But if this developer has been laid aside for a few days ready mixed for use, when it is again brought into requisition it will be found to have gone perfectly useless. When in this condition I have developed plate after plate, to test, and could never got an image beyond the weak, miserable stage. Under these circumstances, and knowing that the plates had been fully exposed, I have washed them thoroughly and then re-developed with

No. 1.	Soda carbonate	4 ounces
	Water	32 ounces
No. 2.	Soda sulphite	4 ounces
	Pyrogallic acid	1 ounce
	Water	32 ounces

For developing, take one ounce of No. 1, one ounce of No. 2, one ounce of water, mix and it is ready for use.

I thus obtained density, brilliancy, and half tones without trouble, proving that the plates had been fully exposed, and teaching me that for hydrochinon to be successful it must be made up fresh every time before using.

George Mason.

TID BITS.

A PAPER negative can be made from an unmounted print placed face down on silver paper in printing-frame same as a glass negative. Print deep and tone same as silver prints. In case a good negative gets broken you can thus make a good substitute.

For local reduction where the high-lights are too dense take old soft cloth, wet with alcohol, and rub with finger on parts to be reduced until sufficiently thin. This will be found a great improvement to many negatives; simple and no risk. Alcohol, with a touch of castile soap, will remove almost any yellow stains that appear on prints after they are dry or burnished; also metallic spots.

L. B. Salter.

FUMING SENSITIZED ALBUMEN PAPER.

It is surprising to the student of photographic printing methods that he finds so little progress has been made in so important a feature of the work as "fuming" since its introduction more than a quarter of a century ago.

For the professionals and amateurs who usually prepare but little paper, and that in small sizes at a time, some of the early and crude methods may answer. But when we find in many of our large establishments a discarded packing case, old chest or roughly constructed box fitted with hooks, cords, or pins for such work, one is led to at least mentally enquire whether the proprietor reads the photographic literature of the day, or cares for his own or employés health and comfort, and if he ignores the waste and destruction of his property by the diffusion of one of the most subtle of chemical agents through his entire premises.

Good work is often done with imperfect tools or faulty methods, but it is always at the expense of health, time, or material.

The more perfect the way the less the cost.

About fifteen years ago the writer gave considerable time to the study of methods in use for fuming paper in the principal New York galleries, and read all he could find printed upon the subject, which, with his own experiments and experience make quite a "bundle of facts." After studying a little he concluded that a convenient, economical, and efficient fuming-box could be made; and the following description and illustrations will make clear to the reader the means and methods through which he has since continued to believe that the end sought for was accomplished. If the question is asked "why he has so long delayed publishing this for the benefit of his fellow-workers," the only apology is that the apparatus was put in a small room so situated as to be inconvenient for making a negative of it, and considerable labor was required to remove the box to a place where it could be photographed.

Fig. 1 gives a general idea of the apparatus as it appears when closed.

Fig. 2 shows detail of construction so far as visible, and the valves or slides for confining or diffusing the fumes and for ventilation will be understood by description.

At the bottom of the case is a capacious drawer, large enough for storing several reams of paper. Above this is a narrow drop-door with ventilating valve (seen open in Fig. 2). This

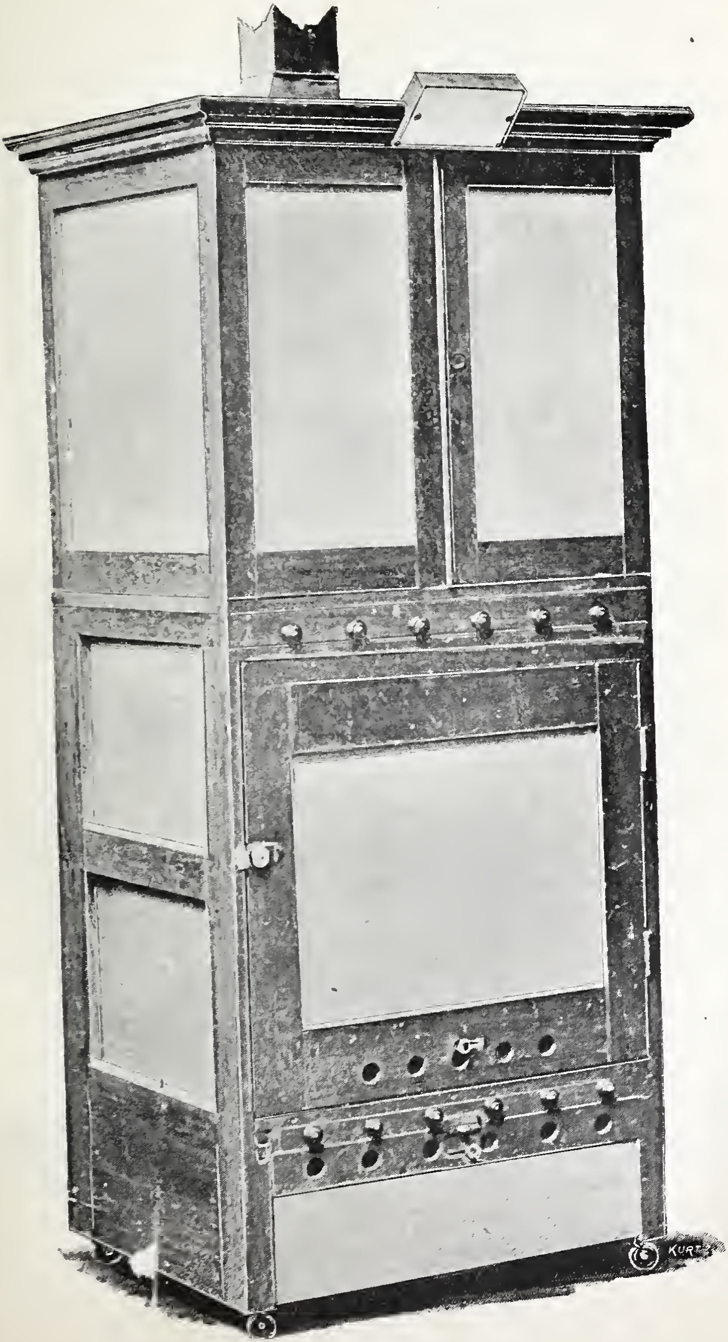


FIG. 1.—MASON'S FUMING BOX.

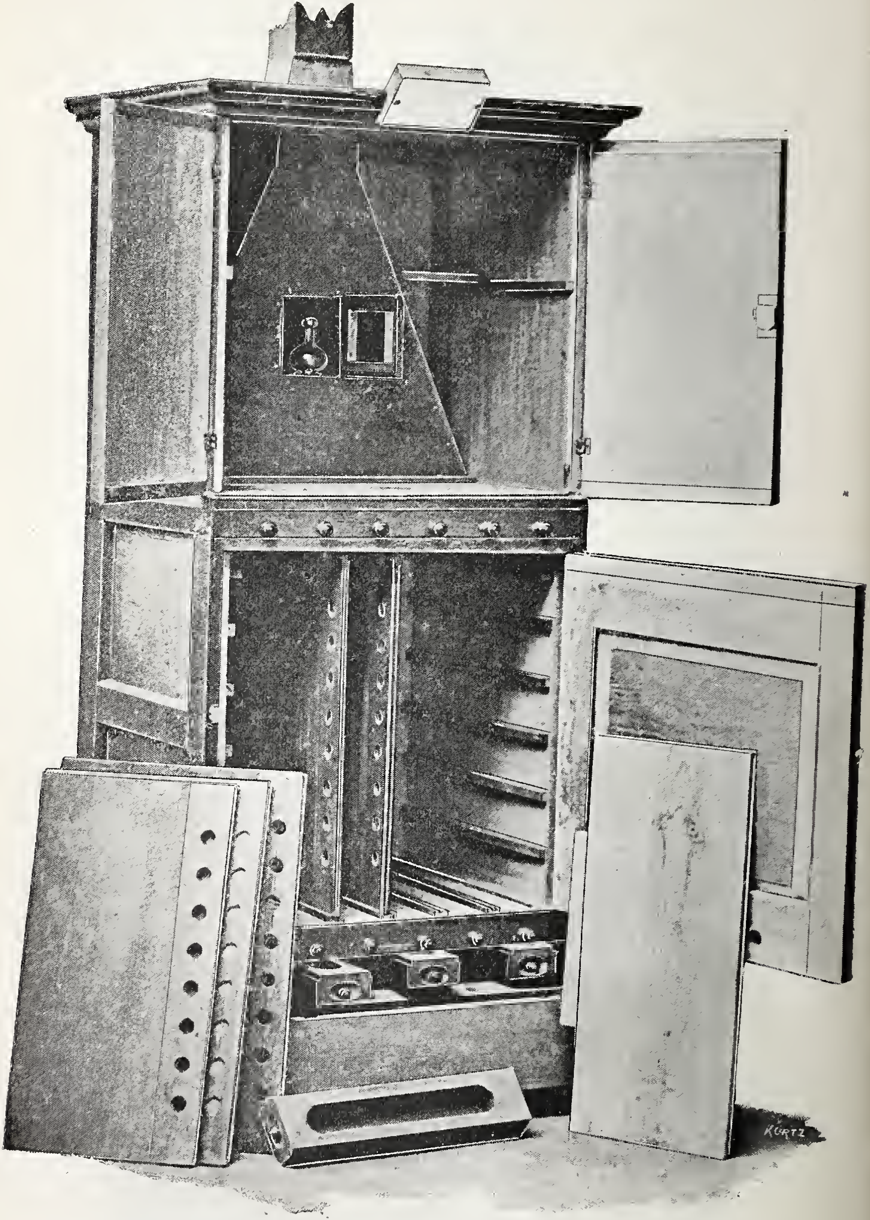


FIG. 2.—MASON'S FUMING BOX.

leads to the pans in which the fuming material is placed. Above this narrow door are the knob pulls by which the valves leading to the fuming chamber are worked, similar in action to organ stops. At the base of the fuming-chamber door may be seen ventilating valves for admission of air to the chamber. Above this main door are the pulls or knobs for putting the chamber in free communication with the draft or ventilating pipe leading to the open air through a chimney or other opening.

The upper chamber, with folding doors, is used for storing fumed paper, and contains the base of the ventilating pipe in which is a small shelf. On this a spirit lamp is placed for draft purposes when occasion requires. Above the door is a tablet for recording any details in progress of work. At the top and bottom of the fuming chamber may be seen grooves or guides for holding the partition boards shown in Fig. 2, and on each side of the chamber are cleats upon which these partition boards may be laid for forming a series of horizontal chambers. By the way, I should state that the chamber is square, so that the partitions may be set either vertically or horizontally, into which the fumes are admitted through the slide valve seen in one edge of each partition. By placing these partition shelves with the valve edges alternately front and back, complete circulation is obtained throughout the entire series.

The paper under treatment may be attached to these partitions or shelves when they are in a vertical or horizontal position, or the sheets may be fumed without removal from the drying- rods, the ends of which can be inserted in a rack at the back of the chamber.

By the use of two of the partitions, as shown in Fig. 2, a narrow chamber may be made in a moment, and the fuming material placed in the receptacle immediately below, thus securing economy for a small quantity or a single sheet of paper.

The distributing or ventilating valves at base and top of chamber are so constructed that when any one of the knobs are pulled forward a series of thirty-five $\frac{3}{8}$-inch holes is opened below or above the one of the six compartments to which the valve belongs, and when the knob is pushed back all these are closed. It is thus made convenient to stop the circulation of fumes or air at any time, and to use the apparatus without the escape of even the smallest amount of fuming material into the fuming chamber when not needed, which is important when removing a fumed lot of paper and filling with another charge, also for keeping the air in the room free from contamination.

Health and convenience with economy of time and material are worthy the thoughtful consideration of workers in all departments of science and art.

O. G. Mason.

REPRODUCTION.

Photographers as a class do not take as much interest in copying as they should. It is a branch of the business which is quite profitable, and should receive more careful attention. I will take one class of copying—that of enlarging from a smaller to larger size by negative and contact printing on albumen paper, with some effective work by your artist to give it force.

Supposing there is a card size head to be enlarged to 14x17 size. The card or original may be faded and hard, which is generally the case with old pictures. Don't mind that. Take the original, clean it with cotton slightly moistened with water, spot it carefully, very lightly, then make any alterations with ink and white color mixed with yellow to match the color of the picture. Fasten it to a head-rest; light it up by the side light or side window far enough back to avoid showing the grain of the paper. Use a quarter portrait lens, focus carefully, see that the camera is steady, stop the lens down just enough to sharpen the picture; *remember* you don't want a microscopic reproduction of the grain of the paper, which, by the way, is a common mistake; therefore don't stop down to excess. Now expose, say, about thirty to fifty seconds in a good light (using a rapid plate); during part of the exposure *vibrate* the camera slightly, or, preferably, *remove* the stop during the last five or ten seconds, according to the extent you wish to soften or take away the hardness of the picture; this is not a new idea, but I have used it successfully for years. By this method you can secure a delicate negative from almost any old picture.

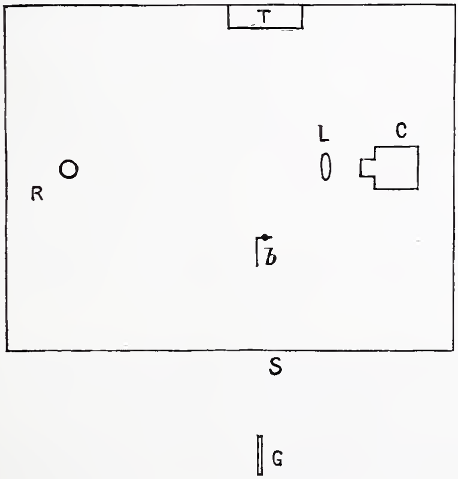
In developing, proceed with caution, use weak and partly old developer, adding new as you proceed. Always overtime so as to allow the use of older developer, which gives better control of the lights.

I will not dwell on retouching, yet would add this advice: Don't destroy the likeness; build up the lights and nurse the shadows—they are very essential. Print on albumen paper, and if necessary, have it touched up slightly.

George C. Mueller.

PHOTOGRAPHY AS APPLIED TO NAVAL ORDNANCE.

The applications of photography to ordnance are manifold and important, and although in many cases where a successful photograph would be of the greatest interest scientifically, as, for instance, the picture of a large projectile in flight, or at the instant of impact on a target plate, the mechanical means by which these results could be obtained have not yet been perfected. With present resources, however, some few things have been accomplished.



C. Camera. *R.* Ruhmkorff coil. *L.* Lens. *G.* Gun. *b.* Circuit breaker. *T.* Sand bag to catch bullet. *S.* Hole in wall covered with orange paper.

Last year, following the Austrian experiments on the same subject, after repeated trials and many failures, a .45 calibre bullet was successfully photographed at the Naval Academy Laboratory while traveling at the rate of 1,300 feet per second. The cut represents the arrangement of the apparatus used, a Ruhmkorff Coil, the secondary circuit of which was broken by the passage of the bullet, and gave a spark of sufficient intensity to make the photograph. The coil, the camera, and the circuit breaker were placed in the dark-room, while the gun was placed outside the room, and fired through a hole in the partition.

The perpendicular distance of the circuit breaker *b* from the axis of the camera lens was found by experiment. The bullet passing through *s* struck *b* and broke the circuit, thus making a spark at the instant the bullet passed in the field of the camera lens. By measuring accurately the perpendicular distance of the circuit breaker from the axis of the lens, and knowing the initial velocity of the bullet (1,350 feet per second), a method was at once suggested of determining the inductive interval of the coil. Of course there was no detail in the photograph of the bullet as the picture was made by contrast, but a clear, sharply defined outline was obtained.

Instantaneous Photography of Target Practice at Sea.—The regulations of the service require every cruising ship to have target practice once a quarter. The reports of this gun practice are then sent to Washington, and include a diagram showing the position of the target, and the point of impact on the water of each shot. Heretofore it has been the custom to estimate as closely as possible by the eye, the distance the shot strikes to the right or left of the target, and the distance it goes over it or falls short. Obviously such records at best are only approximations. The following plan of recording the practice by photography was worked up at the proving ground, and the outfit is now on board the U. S. Cruiser *Atlanta* for trial.

The target, which from the water line to the top line of the vane on the pole, is exactly twenty feet high, is dropped overboard, and the ship steams away until the target bears about 1000 yards on the beam. An observer with a camera is located in a boat, and takes his position about 500 or 600 yards from the target at right angles to the line joining the ship and target.

The camera is a 6½x8½, fitted with the Eastman Roll-holder, and is mounted with a ball and socket joint on a stanchion in the boat. When the observer in the boat is ready he signals to the ship, and a gun is then fired at the target. The observer watches for the splash, and immediately photographs it. The roll is then turned for a new exposure, and a second shot is fired and the splash photographed, and so on until the practice is over.

The negatives give a photograph of the splash and target.

The height of the target is first measured by a scale which reads to .05 of an inch, and also the distance between the splash and the target; a table is then entered with these measurements, from which the actual distance of the splash beyond or short of the target is taken out in yards. The distance to the right or left can be photographed in the same way from the ship, or estimated by eye, and these two co-ordinates gives the exact distance of the splash from the target. The distance of the target itself from the ship is measured by sextant angles from the mast-head.

Photographing the Interior of Guns.—The English method was to place the camera outside the gun, either at breach or muzzle, and reflect the image of the spot it was desired to photograph by a mirror placed at an angle of 45 deg. on the end of a rod. The light was supplied by an arc light, the carbons placed horizontally between the camera and the mirror. Of course this gave very small pictures.

The method was improved at the Proving Ground by constructing a small camera and inserting the camera itself in the gun. To make the image the normal size, the camera is fixed on the rod with the sensitive plate at a distance from the lens equal to twice the focal length of the lens, while the distance of the mirror from the lens is twice the focal length minus the distance of the central point of the mirror to the surface above it. There is no plate-holder, and the plate is inserted directly in the camera. It is hoped soon to perfect an arrangement by which the arc light will be superceded by the flash light of pure magnesium, which is practically smokeless.

The photographic practice at the Proving Ground is altogether of a technical character, and to make pictures of target plates where there is no detail, shot holes in wood and iron, fragments of projectiles, and such subjects as a bright steel gun mounted on a carriage of dark metal require special treatment, but under all the varying circumstances with every range of subject, slow plates (sensitometer 16) and pyro developer (Cooper's) on account of its flexibility, have been found to give most satisfactory results. Perhaps the hydrochinon formula is best for photographing right-line drawings, because the pyro developer clogs the clear lines before the rest of the plate has acquired sufficient density to make a good negative.

Quick plates, like storm-sails, are good for an emergency, and where a slow plate would not answer; but it is believed for general work the slow plate should always be used, and above all the beginner should thoroughly master the handling of a slow plate before attempting to work with the shutter.

Albert Gleaves,
Lieut. U. S. Navy.

THE CAUSES OF CLOUD-LIKE MARKS AND STREAKS ON GELATINE PLATES.

During the earlier days of plate manufacture, when the necessary proportions of gelatine, water, and sensitive argentic bromo-iodide were but imperfectly understood, it was not uncommon to find commercial plates disfigured by streaks and markings resembling faint cloud figures. In many cases these did not constitute a real defect, as they generally disappeared after fixing, and were nearly imperceptible in the finished print.

Such a plate examined by the dim red light of the dark closet is apparently clean, but if it is held obliquely and carefully inspected at varying angles by reflected light, the marking will scarcely escape observation. Examined by transmitted light they are invisible. In some cases the defect is so slight that only a very careful examination by dull white light brings them to view. Such a plate should be rejected as imperfect. In the commercial plates of the present day this defect is but rarely seen. In some hundreds of plates by different makers I have found by careful inspection in white light only an extremely small percentage showing this blemish.

This is largely due to the use of better materials, especially the gelatine, improved methods of manufacture, a better knowledge of the proportions of the essential ingredients, and a greater accuracy in the measurement of the emulsion required for each plate. The working of large quantities of emulsion is also less liable to be followed by this particular defect than when small quantities are used, because in small quantities intractable residues of heavy silver bromide are more likely to be emulsified, and such residues are destructive to the perfect integrity of the finished plate.

It is chiefly then the amateur who seeks to make his own plates who finds the most serious annoyance from these surface blemishes. After every other fault has been conquered, this particular one, like the ghost of Banquo, refuses to "down" at his bidding and constantly returns in a greater or less degree to render futile his most careful efforts.

In other respects his plate is all that can be desired, but when it is dried the tell-tale blemish reappears to remind him that somewhere there has been a failure to eliminate the unknown cause of the ever-present defect. In the many published formulas and directions for emulsions I have thus far found but little information as to the causes leading to the production of this particular form of blemish. In most treatises it is simply referred to without suggesting either the causes or any efficient remedy. My own experience leads me to believe that the causes are quite numerous, not always easy to detect, and frequently hard to entirely eliminate, and yet it is altogether possible after gaining a definite knowledge of the varying causes to succeed in making a large percentage of perfect plates. I say designedly a large percentage because the amateur must not expect to have a complete success with every plate. Any one working with comparatively small quantities of emulsion is placed at a disadvantage from the very start, but this may be reduced, and to such a large degree overcome that the resulting product will yield about 90 per cent of perfect plates.

In searching for some of the chief causes of this trouble we quote, first, from Dr. Eder, as the most trustworthy authority. "Irregular cloud-like formations or streaks are the scourge of the emulsion maker; they may arise from different causes. When the emulsion is spread upon the plate with a rod holding partly congealed portions, or with a brush holding emulsion near the setting point, or when emulsion residues are imperfectly mixed, the plate will show streaks and marks due to irregular spreading of emulsion portions at different temperatures. If the same emulsion is poured by hand, instead of spreading with a glass rod or brush, they are less likely to appear. Great differences of temperature between the plate and the emulsion also favor the appearance of such markings. They appear again more readily when a hard and quickly setting gelatine is used, less frequently with a very soft variety. Different methods of preparing an emulsion also have an influence upon this result. The method by ammonia silver oxide is more productive of such defects than the method by boiling.

"In nearly all cases, however, the main factor in the production of this fault is an *improper proportion between the gelatine, bromide of silver, and water.* An emulsion containing equal parts of silver bromide and gelatine, and but comparatively little water will nearly all produce irregular markings. If now the gelatine is doubled and the water increased, the markings will be less numerous or disappear altogether, especially if a part of the gelatine is replaced by a very soft variety."

In addition to these causes mentioned by Eder, I would call especial attention to the fact abundantly proven by many experiments that the *character of the silver bromide* has much to do with the production of this fault.

In a former article, "An Improved Method for Cold Emulsions," ANNUAL for '88, the assertion was made that a highly sensitive silver bromide is specifically heavier, and the individual particles coarser than in a slow emulsion. In a freshly mixed undigested and unboiled emulsion the silver bromide particles are, according to Eder, but 0.0008 m.m. in diameter, but after cooking or a long digestion at 100 deg. Fahrenheit, the particles increase to 0.003 m.m. My own experiments would seem to teach that the coarse grained modification of silver bromide usually highly sensitive, is much more likely to produce defective plates, *i. e.*, surface markings, than the finely divided less sensitive variety. In my early experiments, my attention was almost exclusively confined to the production of slow emulsions for landscape work, and the percentage of failures to produce a clean surface free from streaks or markings was extremely small. Later efforts to make a highly sensitive plate equaling the most rapid commercial plates showed a much larger percentage of surface defects. We may add, then, to the causes enumerated by Eder, the use of a specifically heavier and coarser grained silver bromide produced either by long cooking or by cooking and subsequent digestion with ammonia.

The nature of the surface upon which the emulsion is poured also has an influence upon this result. Perfectly smooth glass without any substratum is more likely to leave markings than ground glass.

The size of the plate also makes a difference. A large plate, other things being equal, is less likely to leave markings. The length of time in drying is also an important factor. Plates which consume more than twenty to twenty-four hours in drying are likely to show markings at the spot longest in drying. In the farther investigation of this subject we are inevitably led to consider the very important question, what are the proper proportions between gelatine, silver bromide, and water, and as we take it for granted that the amateur is desirous of producing rapid plates, we will examine the propor tions for the heavy sensitive variety of silver bromide. In selecting a gelatine for the emulsification it must be remembered that the harder sorts are decidedly more prone to produce markings than the softer kinds, but as the softer gelatines are not sufficiently resistant under alkaline development, we are compelled to use a mixture of moderately hard and very soft varieties. Standing at the two extremes we find that Simeon's gelatine is perhaps the hardest and most resistant, while Nelson's is the softest and most feeble in resistance. A medium variety, inclining rather to hardness, is Heinrich's.

For some years past I have used only Heinrich's and Nelson's in the proportion of two parts Heinrich's to one part of Nelson, and in special cases equal parts of each with very good results. The proportion of water is also an extremely important factor.

If an emulsion contains an excess of gelatine or too little water it flows slowly and thickly over the plate, sets very rapidly and unequally, and almost certainly will show markings on the dried surface.

If water is now cautiously added and another batch of plates poured they will be found cleaner. Water is again carefully added and a third series of plates coated; these latter will be found nearly perfect. If now the percentage of gelatine is calculated and compared with the volume of water, it will be found that there is only a slight surplus of gelatine present, over that which is necessary to hold the silver bromide in suspension; this is the ideal proportion; more than this is unnecessary, less is ruinous.

If when this point is reached still more water is added, the plates set very slowly, the silver bromide not being held in suspension, settles to the back of the plate, which is now practically worthless, although the surface may show no defect. Having determined the proportions of water and gelatine, the next point of inportance is the proportion of silver bromide to the gelatine. In manufactured plates we find in this respect wide differences, each maker being a law unto himself.

In a recent analysis of a deservedly very popular and highly sensitive plate we found in seventy-six grains of dried solids eighteen grains of silver bromo-iodide and fifty-eight grains gelatine or over three times more gelatine than silver salts. This quantity was taken from four 5x8 plates, giving to each plate four and a half grains of silver bromide combined with fourteen and a half grains of mixed gelatine with probably an excess of soft gelatine as the plates were not resistant without alum in the hypo.

Plates of other makers gave a still higher percentage of gelatine.

As a rule the more sensitive the plate the larger was the proportion of gelatine to the silver bromide.

In my own plates I have never found it necessary to give more than two and a half parts gelatine to one part silver bromide, this being the extreme limit. This combined so as to give a 4 to 5 per cent. gelatine solution will give more satisfactory results than a higher percentage of gelatine. This will give for the finished emulsion ready for coating, say,

Silver bromide	12 grains
Soft gelatine.	15 grains
Hard gelatine	15 grains

in

Water	600 minims

giving

Total gelatine	5 per cent
Silver bromide	2 per cent
And Total Solids	7 per cent

requiring to produce the proper density of four and a half grains of silver bromide 225 minims of emulsion for a 5x8 plate.

The gelatine can be reduced to 4 per cent., the silver bromide remaining the same, and the result will be satisfactory provided certain other precautions are observed. The most important of these is a proper temperature for the emulsion and for the cooling plate. The emulsion should not rise beyond 105 deg. Fahrenheit, nor sink below 100 deg., the latter being the best point. The setting plate should not be above 45 deg. The emulsion should be measured for each plate, and as large plates usually show less defects than smaller ones, it is better to pour 8x10 rather than 5x8 or 4x5 plates, and cut down to the proper size. With the proportions above given, with clean glass, with a well-filtered emulsion, and with increased experience in technique, which only practice can give, I have been with the very limited facilities found in an ordinary dwelling, such as a small dark closet with an adjoining room, which can also be made light-tight, able to produce 90 per cent. of faultless plates, using an extremely sensitive silver bromide. In conclusion we may sum up as follows:

The gelatine must be composed of hard and soft kinds, two of hard to one of soft, or equal parts of each.

The total gelatine should not exceed 5 per cent, 4 per cent being usually sufficient, giving better results than with an excess of gelatine.

More gelatine than that which is required to hold the silver bromide in uniform suspension until setting is completed is useless.

If less than 4 per cent. is used with a very heavy bromide of silver, the latter may settle to the back.

As a rule, 2 per cent. of silver bromide is amply sufficient to produce sufficient density. An excess is liable to produce markings.

The emulsion must be filtered at each pouring and not exceed 100 deg. Other proportions may be found giving equally good results, but in the majority of cases, other things being equal, the quantities given will be found best for initial trials. *R. E. Van Giesen, M.D.*

SNOW PICTURES.

In this climate, when winter has fully set in, and when bare, bleak branches take the place of leafy boughs, with cold gray instead of grassy green, we lay our cameras by and abandon out-of-door work for a time.

When the snow comes we may bring them forth to try to obtain some of the beautiful effects which then meet the eye.

It appears to me that there are two distinct classes of snow-pictures. In the one we have a landscape in which white takes the place of green.

This in itself is something very pretty. But to my mind the most beautiful pictures are not snow landscapes.

Sometimes here we have a fall of snow, during which the little wind there is comes from a southerly point. The snow flakes are large, slightly moist, and fall like white feathers. They cluster and cling about the trees, giving every branch and twig its coating, and producing a result like our conception of fairy land. This is the kind of snow-picture which I think exquisitely beautiful. I have taken many negatives of both the ordinary snow-covered landscape, and also the second variety, and it has appeared to me that just as the desired results differ, so must the *modus operandi* for obtaining them.

For the first variety I select a calm day, preferably in the afternoon, and choose a view in which the foreground shall have some evergreen trees. The sun had best be well to one or other side. By this means you obtain very pretty shadow effects. For such pictures also I use a small stop, about $\frac{f}{32}$, give a liberal exposure, and use a developer weak in pyro, or better still, begin with such a developer and end with some *old* solution. It has always seemed to me that by this means you get a softer and more harmonious negative. The very character of the view gives you strong contrasts. A picture in which the snow comes out as if it were whitewash clumsily applied to trees and ground is void of beauty. By the full exposure and the weak or old developer this disagreeable result is obviated and a very pretty negative is your reward. For the other variety of snow effect I adopt quite a different plan.

The beautifully soft, feathery appearance of the trees and ground when the flakes, large and moist, have fallen and adhered, only occurs here during a perfect calm. The first puff of wind which causes the least motion shakes off the clustering flakes and the beauty is gone. Frequently I have gone out while the snow was still falling, and the light very poor, in order to obtain just the effect I wished. For such views I give the briefest exposure with a medium stop, say $\frac{f}{20}$, and develop with ferrous oxalate. I do not pretend to explain why, but I know that the best negatives which I have ever obtained of such views were got with this developer.

Do not be in a hurry, give the solution time, and I am sure you will be pleased with your work.

George L. Sinclair.

BITS OF ADVICE.

The secret of success in amateur photography, as in every other field of research, lies in the ability of the beginner to grasp and comprehend the fundamental rules which underlie his chosen pursuit, and the tenacity of purpose and strength of will to hold fast to these rules until the end desired is accomplished. Experimental work is always laudable, of course, and is to be encouraged, but such experimental work should only be undertaken after one is well grounded in the rudiments, and not at the outset. If the amateur would hold hard and fast to a few simple rules, and not experiment with all kinds of plates and developers, he would save time, money, and patience, and would get pleasure where far too many meet with nothing but failure and discouragement. After eight years, during four of which I have used but one developer, and, so far as possible, one make of plates, my advice as to these rules would be:

1. Buy plates made by the principal plate makers. They all try to make "the best," and the commercial plate is far, far ahead of any plate you can make yourself. If you doubt this statement, try it. I've satisfied myself that I can lengthen life by buying plates instead of making them.

2. Buy plates by the gross and not by the single package. Get all of the same emulsion, then if one dozen is good, the rest will be the same. By the time you have used the gross you will know how to use that make of plates. If they suit you, *stick to that brand.*

3. Take the advice of a friend and use one developer, first, last, and always. Don't let any one get you to change to his pet solution, but keep right on and learn how to use your own.

4. Don't get the most rapid plate in the market. 20s are quick enough.

5. Use small stops on exposures.

6. Don't try instantaneous work at first. It's quite a scientific operation to develop a plate with rapid exposure. The plate must be very quick for this kind of work, and extreme rapidity means extreme care in all operations, and the most favorable conditions all 'round.

7. Don't try flash lights to-night, interiors to-morrow, seascapes the next day, portraits the next, and landscapes sandwiched in between. If you do, your percentage of good negatives will be very, very small. These subjects are widely different, and require altogether different treatment, and each must be taken up and mastered separately.

8. Cameras. Please do not buy a cheap outfit. I haven't a word of fault to find with the many outfits placed upon the market, considered simply for what they are. They comprise a good deal for the money, and remarkably fine results are produced by them, but when you have made up your mind to go into photography, buy a good camera, one with a reversible back, by all means, and with rising front of good capacity, and single swing.

9. Get the best lens you can afford. If you have not quite money enough to get a good one, wait until you have, and then purchase. It is well known that good work can be done with ordinary or poor tools, but don't let this knowledge influence you one bit. With the best that you can get you will have days when you will realize that "Man is born unto trouble, as the sparks fly upward." Of two lenses, one at

$10 and the other $50, both made by reputable parties, if you have the $50 to spare, buy the $50 lens. The $10 lens will undoubtedly do good work, but the $50 lens will do far better. There are many grades between, but the point I wish to make is this—get the very best you can afford. With a good camera, a good lens, and a gross of plates, and a good developer, go to work to win, remembering that "*The secret of success is constancy to purpose.*"

You can't waste plates to better advantage than by exposing, say, half a dozen on the same subject, preferably a landscape, giving them all the same time as nearly as possible, and then going to your dark room to develop them. Take a normal developer and put in on the first plate. If much overtimed the plate will probably be spoiled before you can modify the developer. Now take plate No. 2. You know this has the same exposure, and if No. 1 was over-exposed, this is also. Mix developer as follows: Normal quantity No. 1 (pyro) and one-quarter the prescribed quantity of accelerator. If image hangs back after a few minutes, turn developer into graduate, cover plate with water, add, say, one-quarter dram more of accelerator, pour off the water and flow plate with this developer. In this way the plate is under control from the start, and accelerator can be added from time to time as may be necessary until the plate is fully developed. If under-timed, work the other way, using small quantity of pyro and normal quantity of accelerator, adding pyro until proper density is obtained. By the time the half dozen plates are developed you will have obtained the key to success in developing. I don't mean that you will have become an expert, but you will know what to do under conditions of over and under exposure.

Buy a keg of hypo, or enough so that you can always have at hand fresh solutions of this chemical, but keep it as far removed from your developer as you can.

Printing from the negative is a branch which cannot be entered upon here. I follow the instructions given in "Hearn's Practical Printer." *W. J. Hickmott.*

PREPARING UNMOUNTED PRINTS FOR ALBUMS.

Prints carefully mounted as follows will remain flat and can be burnished and retain as fine surface as when mounted on a card, with but slight increase in bulk. In cutting the paper from the sheet, cut to the full size of the negative, to allow as much margin as possible for trimming, and draw a light pencil mark along the back in the direction of its greatest expansion when wet which is across the original sheet. Print, tone and wash as usual. Cut from plain Saxe, or Rives paper, a piece the same size or a little larger than the print, being particular to cut it so the expansion will be in the same direction. Wet this thoroughly. Remove both from the water and press for a minute between blotting paper. Lay the print face down on the plain paper and cover the back with a thin coating of good paste. Reverse the print and carefully place it on the plain paper, and rub well together, and with a pair of shears trim the edges slightly, so the print and its back will exactly coincide. This is important, for if one part projects slightly beyond the other it will wrinkle when drying. Press between dry, flat blotters, under a pressure of eight to ten pounds, and change from time to time into dry ones, still continuing the pressure until the print is almost dry. It can now be burnished the same as if mounted on a card. After burnishing, again place in dry blotter, under pressure, for half an hour, or more. It can now be trimmed, and if care has been used in the preparation it will remain flat, without wrinkles, and present a fine, smooth surface. Such prints, mounted in an album by pasting slightly at the corners or edges present a neater appearance than when mounted by the usual method, as the print has a more finished surface and the cards will remain flat. *Samuel Wadsworth.*

GROWLING.

By keeping a cloth over my opened box of plates in the dark-room I find less trouble from "*flat negatives.*"

By throwing a cloth over the camera and plate-holder during exposure, I am less likely to get mad at "*foggy plates.*"

By not wanting to see what the image is going to look like before it is half developed, I have saved many a negative that would have been lost by alleged "*poor emulsion.*"

By handling the plate as little as possible during development I keep the film from leaving the glass and sliding into the sink, and I say less about "*frilling.*"

By keeping my dusting brush away from the water-tank many a plate has been saved; they would have been lost on account of transparent lines running down the plate, perhaps caused by a wet brush, but more likely attributed to "*streaked plates.*"

By pulling the slide from the holder quite slowly I escape the expense and trouble of shipping the plates back to the maker, only to have these plates returned at my expense, with a splendid negative made by some "amateur" from the same box without a trace in them of "*transparent spots.*"

By drying my negative where the air can strike the whole surface at once, I do not have all the colors of the "*rainbow on the film.*"

By keeping the inside of my camera wiped out with a damp cloth instead of dusting it, I save many a plate from "*pin holes.*"

By keeping the outside of the camera wiped with an oiled cloth I make folks believe I have quite recently bought the latest improved American Optical Co.'s instrument.

By keeping my silvering-room well wiped up, especially just before silvering, I save many a vignette from having metallic silver spots, which is more agreeable than finding fault with the paper-maker and albumenizer.

By laying a white cloth in the lap of the old lady with a face like a "war map" I get no heavy shadows.

By powdering the hair of the red-haired girl white, and that of the man who has not much hair of any color "yellow," I get for both very satisfactory results.

By making my own sittings I find customers better satisfied even if I do nothing but squeeze the bulb.

By attending to my own business and letting my opposition do the same, I find I have about all the business I can take care of.

O. Pierre Havens.

MINNEHAHA IN WINTER.

There are many grander scenes than Minnehaha Falls, but few that exceed it in wild loveliness, and perhaps none about which poetry has woven a finer charm. One should visit it after a fresh reading of "Hiawatha." Then, if he "love the haunts of nature," "love a nation's legends," "love the ballads of a people," he is prepared to look upon that picture of the silvery, foaming cataract: vignetted in its bower of foliage, jewelled with the arching rainbow, as it leaps into the ravine, and goes hurrying, laughing down into the Mississippi. Then shall its splashing water sound to him, as it sounded to the red men long ago, who stopped to listen to its music, and gave it the name of Minnehaha—laughing water. Then with the poet's help shall he see the wigwam of the ancient arrow maker, and, looking down the ravine, fancy the forms of Minnehaha and her noble lover, passing into the woodland and the meadow, where they

> "Heard the Falls of Minnehaha
> Calling to them from the distance,
> Crying to them from afar off,
> 'Fare thee well, O Minnehaha!'"

Photographed by Rev. H. Macy. MINNEHAHA FALLS IN WINTER. Levytype Co., Phila.

Summer views of Minnehaha are very common and very much in demand, and many of them fairly represent the description of the poet, who never saw the Falls by the way, but who correctly describes them in the lines:

> "Where the Falls of Minnehaha
> Flash and gleam among the oak trees,
> Laugh and leap into the valley."

It occurred to me that a winter view, when the frost king had piled the water up into pyramids of ice, would be attractive, and so one clear, zero morning, I got ou my camera and betook me to the spot. The light was wonderfully brilliant and required the smallest stop, and an exposure just long enough to cap and uncap the lens. The position chosen was across the ravine from the point usually selected, and so gives more of a view up the creek. The view here presented is the result of that morning's trip, and in my mind is rather associated with the pathetic part of Longfellow's song, when in "the cruel winter," as the lovely Laughing Water lay dying, she "heard the Falls of Minnehaha calling to her from a distance," and felt Death's icy fingers clasping hers amid the darkness.

The reproduction of this very handsome and interesting photograph is a Levytype made by the inventor, Mr. Louis E. Levy, and illustrates his method of making photographic half tones into line, stipple or patchwork plates printable upon the ordinary type press.

SENSITOMETERS.

It is not my purpose to instruct dry plate makers how best to test the sensitiveness of their plates, but it does seem to me, if there could be adopted some method among manufacturers whereby a more uniformity in registering could be secured, it would certainly be to the advantage of the consumer.

Now, as a starter in this direction, I would like to make a few suggestions. Of course I do not know the means adopted by all the plate makers for testing the sensitiveness of their plates, still, I have an idea that something similar to the following would not prove amiss.

Place in a light-tight box three stationary uprights, one with grooves for holding the plate or film to be tested, another and middle one about two inches distant with a thin metal (tin-foil will answer well) diaphragm, with an aperture say of $\frac{10}{1000}$ of an inch, by actual measurement; the third about four inches distant with aperture of about $\frac{1}{4}$ inch. This latter not particular, but arranged with a pneumatic shutter of known speed (which, if thought necessary, could be arranged to open and close by clock work, and set to remain open to the fraction of a second of time required), behind this last upright, the light is to be placed, which will cast a reflection upon the plate, the size and shape of the opening where the shutter is fixed.

Now to test for sensitiveness, slip a plate in the groove to receive it, and with chronometer in hand open and close the shutter length of time desired. The aperture in diaphragm being so very small the time can be accurately measured; then number the plate according to time of exposure.

With a stated size of diaphragm, and distance of plate therefrom, the photographer could more intelligently know the sensitiveness of the plate used. The position of light is immaterial.

The only difficulty I see would be in securing a uniform light, but that is not impossible, and I think could be very easily accomplished.

Another form of sensitometer could be made with a set of diaphragms say from $\frac{1}{1000}$ of an inch (which is not impossible) to $\frac{16}{1000}$ of an inch, all accurately measured, and number the plates from size of diaphragm, having the time the same for each.

W. H. H. Clark.

THE METRIC SYSTEM FOR USE.

It is not necessary just here to raise the question whether it be advisable to displace the ordinary and much varied system of weights and measures by the simpler metric system. The metric system is among us, and has come to stay. It will not do for photographers, especially, to taunt it with being a new-fangled notion, since the system is some fifty years older than photography itself, and its exclusive use in France, by an interesting coincidence, dates from 1840, the year after Daguerre's discoveries, the semi-centennial of which we have just been celebrating. To ignore the metric system is practically to ignore the photography of continental Europe; it is to forego its science and its high practice. Translators simply copy metric formulæ verbatim, and the English reader can be thankful if they pass without mutilation through the hands of the unmetrical printer.

Whether or not the photographer of Great Britain and America shall ever adopt the metric system exclusively, or evenly largely, it is to his present profit to understand the system, and it is with this view of explanation and simplification that this article is written. Most writers on the subject have attempted to teach too much. They have insisted that the photographer shall learn "by heart" the arithmetical scale from millimeter-liter-gram to myriameter-liter-gram, and the rest of it, and this the photographer flatly refused to do. What he wants to know is, what the few names and denominations mean that have come into general practice, and that he has seen mentioned, and how they compare with the weights and measures he is familiar with. In a word, he wants to size up in his hand the weight of a gram of soda, or may be the length and width of a plate 9x13 centimeters, or yet, the height half a liter of developer would stand in a pint graduate.

As a preliminary explanation, it may be remarked that the meter is the French measure of length, a square meter being surface measure, and a cubic meter the measure of weight or bulk. The liter, also, is a measure of bulk used for liquids, and related to the meter in a very simple way—as shall be presently explained—and corresponding to our fluid measure. The principle at bottom which gives the metric system its popularity and that makes it so extremely practical, is this simple relation between length, weight and bulk. Starting out with the meter, very nearly 40 inches long, this is divided into a hundred parts, called centimeters and abbreviated to cm.; just as the dollar is divided into a hundred cents. Each centimeter is therefore closely $\frac{2}{5}$ of an inch; thus 10 cm. equal 4 inches, 15 cm. equal 6 inches. And by the way, this cm. and other abbreviations is pronounced and spoken just as written, thus overcoming a recent criticism about repeating long names. The centimeter is divided into 10 parts, suggesting the mill of our currency, and such parts are called millimeters (mm). Coming back to the centimeter, and imagining a cube, like one of a set of square dice, measuring one centimeter on any one of its edges, then 1,000 of these cubic centimeters (cc) give a measure of bulk that is called a liter. It will be understood that if such meas ure is imagined as a cube, also, (some people would miscall i a square) it would measure 10 cm. on any side or edge.

Now for the standard of weight. If we imagine a cubic centimeter as being hollow, like a little box, and should fill this with distilled water, and weigh it under certain conditions of scientific accuracy, this weight of water would be called a gram (g or gm). This in turn is divided into 100 centrigrams (cg), and each centigram is divided into 10 milligrams (mg). The gram is nearly 15½ grains, therefore four grams are about 1 apoth. dram. Referring back, we find the liter to measure 1,000 cubic centimeters, and it therefore weighs 1,000 grams. This weight is called kilogram, and is in very common use abroad for coarse weighing. Let the uninitiated read this paragraph over, and read it slow, for it contains the sum and substance of the metric system as used in practice. True, by reference to complete tables, such as found on p. 284 of the 1889 Annual, and probably also contained in this volume, numerous other names occur, but only so seldom used in anything a photographer or general reader would come across that they can be counted out. With the landmarks of the system, as it were, firmly fixed in the mind, these extra terms will become fully clear by reference to such complete tables when occasion requires. Thus the meter, gram and liter (l) are divided into tenths, and we have decimeter, decigram and deciliter—again on the analogy of the division of the dollar into dimes—and these tenths are just as seldom used as the dimes are in stating sums under a dollar. The decigram (dg) enjoys the most popularity. It is equal to 1½ grains. To weigh out a centigram, $\frac{1}{7}$ grain, or a milligram, $\frac{1}{70}$ grain, ordinary scales are not delicate enough.

An off-hand approximation is often useful in interpreting metric formulæ, and the old 5-cent nickel has been quite generally mentioned in this connection. The nickel is a trifle over 2 centimeters in diameter, which fact will be better impressed on the memory when one measures a few of them himself. It is scant 2 millimeters thick, since 6 of them, laid one on top of the other, will measure about 1 cm. The weight is about 5 grams, equal to 77 grains, or ¼ more than the apoth. dram; 6 of them would weigh closely as much as one fluid ounce of water, U. S. Standard. This leads to the handy approximation that 30 cc. of water weighing 30 grams, is a fluid ounce. The familiar measure of 100 cc. often found in formulæ will thus be about 3½ fluid ounces. The new nickels are only slightly larger and heavier than the old ones, and do equally well for our purpose.

The kilogram is 3 ounces over 2 pounds avoir., and the liter of water, which weighs a kilogram, is 2 fluid oz. over 2 U. S. pints.

Another suggestion coming from a recent text book of chemistry, is that as much of any ordinary chemical, powdered, as will lie on a cent, will weigh a gram. This may prove convenient for such salts as alum, hypo, sal soda, common salt and ferricyanide or bromide of potassium; also citric acid. It is obviously not very accurate, but conveys an idea of real bulk that the mere name of gram could not convey.

On the occasion of the recent pilgrimage to the semi-centennial of photography, the writer took pains to discover what progress the metric system had made in its commercial aspects; that is to say, in how far dealers and manufacturers were ready to supply any popular demand for metric weights and measures. Incidentally he learned that in New York a great many physicians are using the metric system in their prescriptions, chiefly, however, those physicians of German or other continental schooling. One druggist of large business assured me that by far the larger number of prescriptions came to him written in this system.

By correspondence and interview, as well as through trade lists, the conclusions arrived at are noted below. In passing, the reader may be assured that the small stock of information gathered together at some trouble, is given to show how, where and at what expense photographers can equip themselves. Further, I feel sure that photographic stock houses, like the publishers of this ANNUAL, would execute commissions and fill orders satisfactorily for any of the articles mentioned below, provided they were accurately described in the order.

In the matter of scales it would seem desirable to possess two pairs. For the smaller ones, the ordinary hand scales will supply the working photographer's needs, and those listed from 55 cents to $1.00, furnished with weights to two drams apothecary, will answer; while the more ambitious worker has his choice among the various analytical and prescription scales, and may spend money *ad lib.* A set of weights from 1 cg. to 10 grams can be had at a range of price from 45 to 65 cents. For the other size, while there are larger scales in the market with graduated brass beams and weights up to four pounds avoirdupois, and selling from $2.00 to $3.00, unfortunately there are none to be had at such reasonable figures which carry the metric graduation and weights either in addition or alone. In fact, with family scales to be had complete with weights for $1.00 and less—quites erviceable, too—there are no sets of metric iron weights quoted at less than $1.25, varying from 10 grams to 1 kilogram. There would seem to be a suggestion in this for enterprising manufacturers.

For the metric measures of length there are various wooden foot-rules to be had of stationers, carrying also the metric scale on the opposite edge, and costing only a few cents. These are of the style called printed rules, whereas, the Stanley Rule and Level Co. manufacture an engraved rule, quite clean-cut and accurate, of a length of 30 cm., with the other side graduated in inches. It lacks $\frac{3}{1}$ in. of being one foot in length, and retails for 10 cents. My attention was called to it during an interesting visit at the office of the American Metric Bureau, 146 Franklin street, Boston. This establishment is classed among the public institutions of Boston, and makes a specialty of furnishing metric weights and measures as well as graphic charts for educational institutions, though quite willing to serve the general public. The manager in charge apologized for the rather meagre stock then on hand, as well as for the absence of a catalogue, which was in press; the institution not having fully recovered from the effects of a fire. The stock consisted of scales and weights of different styles and prices, liter measures, and those of the smaller sub-divisions; and also in the way of measures of length there was a handy one a meter in length, printed very clearly on manilla or other heavy paper, and having on the reverse side numerous equivalents and tables of comparison between the metric and old systems, and furnished at a cost of 20 cents. Among the purely educational appliances, and which ought to have been used on us when we were young, was a colored wall chart, showing very nicely, and in full size, the various units of the metric system.

In the way of fluid measures, the trade has long been supplied with graduates carrying the metric and old scales on opposite sides. Although not made as yet in the cheaper grades, an imported German graduate with the two scales is furnished for 80 cents, capacity 4 oz. and 100 cc., and costing one-fourth more than the same quality divided in cc. alone, and other sizes at proportionate prices. Photographers could no doubt obtain them from their dealers, if they mentioned exactly what was wanted.

In dwelling on the cheapness of these appliances, I have been inflenced by my personal observations in studios, where I found the refinements of a chemist's laboratory did not prevail in these particulars, neither is such accuracy ordinarily required by working photographers. I have also felt that it would need the inducement of cheapness to influence photographers in their metric ventures.

Of course, it is too much of a strain even on the metric system to expect to do duty as an efficient substitute for common sense in formula writing. It will *not* show whether crystallized or dry carbonate, or sulphite of soda is meant. Neither will it tell how much bulk of solution a kilo of hypo and a liter of water would make, nor any other solution compounded on the same plan, and containing such watery salts as hypo and crystallized soda or sulphite. Even with the old mixed system a great deal of complication would be avoided, if the writers would say, for instance, " make up the solution with water *to* 8 ounces," instead of "add water, 8 ounces."

Another point: formula writers, among them, plate-makers, have a fondness for batches of developer in half gallon lots. The problem of every experimenter is to reduce this bulk to simpler terms, so that he may know how many grains per ounce this means for the active chemicals, and so that he can compare different formulæ intelligently. This process involves needless and laborious calculations, with the liability of errors with those unaccustomed to such calculations, and almost invariably results in very uneven and fractional quantities, showing that the developers were originally compounded by rule of thumb. Now it seems to the interest of plate-makers, especially, to offer the inducement of a simple developer, if they wish to extend the use of their plates; why not then make a statement something like this:

" We advise a developer of the following composition for our plates:—Pyro, 2 grains; cryst. carbonate of soda, 15 grains; cryst. sulphite of soda, 30 grains; water to make one fluid ounce. The stock solutions given below mixed as directed will give this composition for a normal developer, etc., etc."

This plain statement would give the photographer his option to make up enough developer for one plate or for a season's work, but it would relieve him from the necessity of handling the whole half gallon either in fact or in figures if he only wanted to try a few new highly recommended plates.

This is not metric system, but like the metric system it is practical.

Ottomar Jarecki.

ORTHOCHROMATIC SCREENS.

As THE subject of orthochromatic photography has not yet been fully exhausted, it may interest some of your numerous readers to know what can be done when it is difficult to get the materials for the bathing of plates recommended by the various processes.

Dr. Vogel's Azaline is a good sensitizer, but only millionaires can afford to buy it.

Cyanine is too uncertain for any one except experts.

Erythrosine, when you can get the right kind, is satisfactory, but will not do for photographing a picture that has a great deal of red in it. In my hands it has produced excellent results in landscape photography, but in paintings, flowers, and in any subjects containing red, it is not good.

Fortunately we have a very simple way of getting all the best effects of all these methods, including the best effects in the deepest reds, by the use of a screen alone, without any bath.

For the last twelve years I have had more success with a screen of yellow aniline, than almost any other medium; and, after repeated experiment, it has rarely failed me.

My method of using it is as follows:

Prepare a cell of two pieces of plate glass 5 inches square; between these plates a piece of smooth india rubber ¼ of an inch thick, and, like the glass, 5 inches square; the centre of the rubber is cut out, leaving a clear space 4 inches in diameter, with a channel to one corner to serve as an opening to the space, so that it can be filled with any solutions required; the whole combination is clamped together by two brass flanges with 4 screws.

Fill this cell with the following solution: Water and alcohol equal parts, saturated with yellow analine, and to each ounce of this solution add one drop of a saturated solution of eosine, or the eosine may be added dry by using ¼ grain to each ounce of the yellow analine solution.

The cell, when filled, is now placed directly behind the lens, so that all the light passes directly through it.

Now make your negative in the same manner that you always do, and use any plate you please.

The results are fully equal to those obtained with any orthochromatic plates made anywhere.

The only drawback is the long exposure required; about 200 times as long as would be required if the screen is not used, but the effect will amply repay the trouble, and very many subjects can be photographed in so strong a light that it can be brought down to one minute.

Yellow aniline is a cheap dye, and the solution will keep well.

Next to the aniline I recommend bichromate of ammonia: about 8 grains to the ounce dissolved in water.

The effect is nearly as good as the aniline.

Tincture of turmeric will also give excellent results, especially if a trace of eosine is added. This must be freshly prepared, as it fades by exposure, and is affected by vapors of ammonia.

These screens enable one to do almost anything in orthochromatic photography that is possible by any other known process.

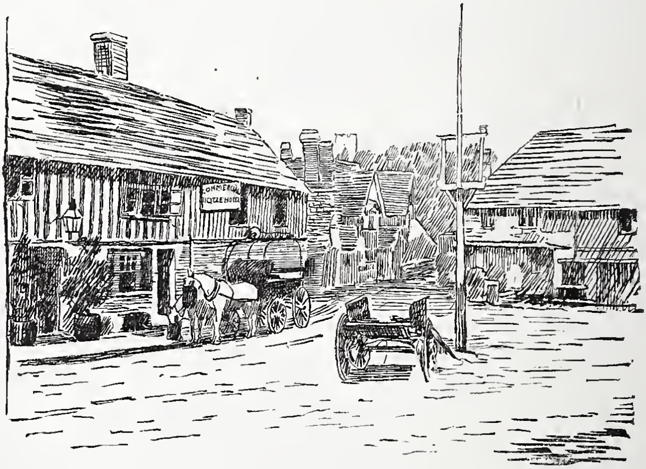
E. Bierstadt.

BLEACHING BROMIDE PRINTS FOR PEN AND INK TRACING.

Although errors in composition are usually considered final in a finished picture, I have devised the following plan for eliminating objectionable features in a group or landscape. Granted that the view is a dead failure because baby moved, or a fence in the foreground came out like dragon's teeth, we proceed to alter the whole photograph by a bleaching process well known to photo-engravers. I am indebted to Ernest Knaufft for both process and formula, and if I am not mistaken, Mr. Knaufft was himself instructed on this subject by Prof. Ehrmann at Chautauqua; at least there was a year or two ago an editorial on a similar matter in *The Photographic Times.* These authorities advise magazine illustrators to study the method, but less ambitious amateurs may find it useful when they wish to save from oblivion some print which has been spoiled for the above reasons. Over-printed pictures as well as under-printed ones may also be rescued from the dark-room waste-basket in the same way. Photogravure work is done on soluble albumen paper, but the solutions, which have no effect on common silver prints or blues, work satisfactorily on bromide emulsions. Possibly something could be done on transferotypes, but I leave such skilled labor to the more skillful. With bromide prints we proceed in the following way: Dip a fine steel pen in India ink, and then carefully go over all the lines of the picture which you wish reproduced, remembering to mark only the essential parts. This is not the work of a tyro, but a little practice shows a person what to do and what to leave undone. Faces are more difficult than landscape or architecture, and should be attempted last. When the ink is thoroughly dry wash the view in a solution of

Corrosive sublimate	1 ounce.
Alcohol	10 ounces.
Water	10 ounces.

In three minutes everything on the paper will disappear save the previously marked parts, and you will have for your albums a spirited pen-and-ink outline sketch, instead of a photograph full of noisy detail. After removing the picture from the corrosive sublimate it should be thoroughly washed, without handling, in plain water. I confess that the bromide paper changes color, but to the artistic eye this brownish shade gives tone and atmosphere. We have at least rid ourselves of the hydra-headed baby or the objectionable picket fence, as un-inked parts bleach beyond recall, and thus do we outwit the too truthful lens, which repeats all it sees. When the print is again dry, it is sometimes well to strengthen certain parts by more ink lines, but the success of such retouching must, of course, depend on the skill of the amateur. This process may seem too troublesome in most instances, but will prove invaluable when one wishes to save some poor print for a collection of pictures incomplete without it. The illustra-



STREET VIEW, STRATFORD, ENGLAND.

tion of the present article is, however, from a most excellent negative kindly loaned me by Mr. A. A. Adee, and shows us Stratford High Street in Shakespeare's town. I am also indebted to Mary H. Skeel for the necessary outlining before and after bleaching.

Adelaide Skeel.

THE TRANSPARENT FILM.

Wonderful achievements in the photographic world have followed each other with such rapidity of late years, that we are no longer startled at anything short of the miraculous.

The more difficult a thing appears before it is accomplished the simpler it appears after it has been accomplished. The greatest inventions of the age appear so simple to us now, that we ask ourselves why has not this thing been done long ago.

This seems to be the case with Eastman's transparent film for roll holders. The public has waited for just that very thing for years, but no sooner was it announced as an accomplished fact than an effort was made by certain parties to discredit the fact that, to succeed in making a transparent film in lengths thin enough and long enough to roll upon a spool, has been any invention or discovery at all. Of course, after success has been attained there are always those who, usually from personal motives, will disparage it. If this is no invention or discovery, why is it others have not succeeded in making a like article? It is surely not because no effort has been made, or that its great desirability has not been fully realized and appreciated. On the contrary, there has been a most urgent and constant demand for a flexible transparent support for the photographic negative.

Even as far back as December 13, 1870, Daniel Spill, the inventor of celluloid, in a paper read before a photographic society, said: "On a future day I hope to offer a flexible and structureless substitute for the glass negative support. My experiments in this direction are not at present sufficiently advanced to enable me to speak positively on the subject," and as he never produced what he was aiming at, it is reasonable to assume that he met with difficulties which prevented him making the *discovery* which he hoped to make.

From this and other experiments made in the same line by others, it is evident that the value of such a thing was fully appreciated.

During the four years that I have been giving demonstrations both in America and Europe, the invariable inquiry has been, "When are you going to give us a *transparent film?* showing that such a thing has been looked for.

Inventions are not always the result of demand, but demand usually stimulates invention. The invention of the roll holder increased both the desirability and demand for a flexible film and made its use perfectly practicable, but still no one succeeded in solving the problem, and the stripping film was welcomed by thousands as the nearest approach to what all vainly hoped for, viz., an absolutely *transparent flexible support.* This the Eastman Co. have *discovered* and *invented.*

It simply amounts to this: other makers have been working tooth and nail to accomplish precisely what the Eastman Co. have accomplished, and having utterly failed they naturally feel sore and disappointed to think that others have got ahead of them.

Those who are free from bias and are qualified to speak, call it the most important discovery in photography for the past twenty years. Since beginning this article, a letter has come to hand from Mr. C. H. Poor, of Skaneateles, N. Y., a photographer of ability and reputation. He says: "After the most thorough investigation, I pronounce the transparent film the greatest discovery in photography of the 19th century."

The transparent film is the result of years of the most assiduous endeavor to supply a flexible support for the photographic negative that should at once supersede glass and relieve the photographer of the most burdensome part of the photographic outfit. The immense advantages accruing from this are obvious and do not require elaboration here; suffice to say, that the transparent film is a perfect substitute for glass and is in every way a complete and perfect success.

The mode of manipulation is so nearly identical with that required for glass negatives that there is practically no difference, the same developing formulas, etc., being used. The only thing necessary that is not required with glass is the soaking of the negative in a solution of glycerine and alcohol after the final washing to prevent curling.

Now that photographers have got what they have been crying out for for years, let them set aside their prejudice and try it for themselves, and they will find no further use for the heavy and breakable glass plates. The days of glass for photographic purposes, so far as out-door photography is concerned, are numbered. *H. S. Bellsmith.*

THE COLORING OF LANTERN SLIDES.

Some method of coloring slides for the lantern that is simple, easy, and gives satisfactory results, is without doubt very desirable. A search through the literature of the day on this subject finds the want practically unsupplied, *i. e.*, rapidity of execution, and perfect transparency of all colors. Any mode, however, will yield but poor results without some study of color and some artistic feeling of the subject to be painted. Yet very many pieces will become much more valuable if they are in some degree differentiated by color judiciously applied. Attention to the subjoined mode of coloring will enable the operator to produce something certainly more satisfactory than anything I have seen or tried.

The first thing desired is to secure a proper surface for the colors on either the dry plate or wet plate lantern slide. For this a coating of gelatine is essential. It must in quality be hard enough and when dried on the plate of sufficient thickness to admit of brush manipulation of the colors in water.

The ordinary dry-plate slide while it possesses a gelatine surface in nearly every case is not fitted to receive colors alike in all places. Any grade of pure sheet gelatine that is used for transparency dry-plates will do for this substratum. To produce the very best results there should be under the gelatine coating a film of plain collodion. In the wet plate this film is already on the glass, and no substance takes the colors so perfectly as collodion, but being tender it will not admit of sufficient manipulation of brush without a coating of gelatine to protect it. Without the collodion very fine effects by any color may be produced.

To prepare the gelatine simply soak it in cold water for an hour or so, then leave enough water to cover it well and dissolve it by heat, strain, and apply to the glass or picture by pouring on as much as will well cover the slide, after which it is placed on a level surface and dried. When dry it is ready for the colors, avoid a room too warm, or the gelatine will work up under the brush.

As regard colors and their use the writer was obliged to solve this problem from the beginning, and succeeded in spoiling a number of good slides before the proper colors were found that would readily combine and leave the work transparent, pure, and possessing practically the same color value either by oil, lime, or daylight illumination. No colors are so deceptive and so easily destroyed by one coming in contact with another as the aniline colors, and yet no colors are so well adapted to this work when one understands how to use them. Procure the aniline or "Diamond" dyes found in the shops, but carefully observe the following directions; no other colors or grades of color must be used: For blue a package of blue "for cotton" will do; other blues give a green by night and so prove very deceptive. This approaches the real blue of daylight more than any color I have found.

It readily combines with yellows and reds for any greens and purples. For yellows and orange, yellow "for cotton," and any orange will be found safe. For reds, eosine heads the list, with magenta for rose and crimson shades, either separately or in connection with the eosine. For green only the combination of the yellow and blue, as will be described, for only in rare instances will the pure green analine be needed, being too harsh for any work save in draperies, perhaps.

To apply them, dissolve a little of the color in water, as fresh solutions are always best. Then with a soft camel's hair brush and pencil laying on the colors as follows: In a landscape commence with the sky and by means of a somewhat large brush, a stripping brush is good, and with not too intense a color, lay on the blue as may be desired for clear sky, or clouds. Rinse the plate before using any other color. If needed, work in a little rose, or eosine, or yellow in the sky for tints, and certain effects of sunlight, as seen in the best oil paintings.

For green lay on a ground of the blue and rinse off the plate, then proceed with the yellow and orange for the green and greenish-brown colors. A violet for middle distance will be easily made by a little eosine or rose color laid on the blue. Fine lines may be traced when the plate is dry, as in any other painting, and beautiful stipple effects wherever needed may in the same manner be laid on.

For draperies and interiors, a great variety of shades may be produced with these simple colors, and for some certain lines and repairs, India ink, and what is known to photographers as opaque, will be found very serviceable. Never attempt mixing the colors before using, in order to make some shade or tints. It seldom results otherwise than to ruining the work and the color. Lay one color *over* another, or for fine effects, as in flesh tints, one color *beside* another. A few trials with care to keep the colors well in hand and not allow them to become too gaudy or bold will quite surely produce pleasing results.

Rev. Dwight W. Smith.

PORCELAIN PAPER.

On having my attention called to an article in a late issue of the "British Journal of Photography" under that heading, I prepared some paper as described and will give the method I adopted after experimenting a little.

Taking plain paper before it had been albumenized, and dividing it in four parts, the better to handle it, I prepared a solution of gelatine and kaolin (or pipe clay), as follows:

Cutting up the gelatine into small pieces and allowing it to soak in water enough to cover it until it had absorbed as much of it as possible; poured off the cold water and added sufficient hot water to cover and allowed it slowly to come to the melting point.

I then added kaolin enough to make it slightly pasty, but still thin enough to flow on the paper.

While waiting for the gelatine mixture to cool a little, I took the one-quarter sheet of paper, placed it in water until limp and put it while wet on a plate of glass and by the aid of the squeegee, absorbed all the water until it laid flat and smooth.

I carefully poured the mixture over the paper as one would flow collodion or negative varnish, and then hung up to dry.

After drying it was placed in a strong solution of alum for a few minutes to harden the gelatine and again dried.

It was then salted in a chloride of ammonium bath, four grains to the ounce of water, and hung up to dry.

In this condition it is said to keep for many months.

It was then sensitized in the same manner as silver paper.

It was recommended to fume the paper before printing, but I did not find it any great improvement, as it prints quickly without that, and I think fuming tends to discolor the paper a little.

It was printed in the usual way, but does not need as deep printing as albumen paper.

After printing I washed in one change of water and changed to fresh water with a few drops of glacial acetic acid, to redden. The water, all through the toning process, should not be cold. I used it about lukewarm.

It was then toned in bath of one grain gold to six or eight ounces water, adding saturated solution sal soda until it turned red litmus paper blue.

It tones very quickly and changes but very little in the fixing bath.

Fix about fifteen or twenty minutes in hypo bath, one ounce hypo to eight or ten ounces water and wash in four or five changes of water and let the prints lay in the last water five or six hours.

It has somewhat the appearance of bromide paper, being no gloss, but has the warm tones of albumen paper, as you can at will range from a brick red to a deep purple.

Care must be taken that while drying the first time it hangs in a place as free from dust as possible.

E. W. Horne.

IN CENTRAL PARK.

This small but pretty and interesting bit, combines several features of the graphic arts. We observe at first an extremely well executed kylogram, engraved by the aid of a direct photographic silver print on the boxwood block. The negative representing the huge Elephants, restless, even when seemingly at perfect repose, is rendered perfectly sharp with a Waterbury detective camera, and a Cramer plate of 40 deg. sensitiveness, developed with alkaline hydrochinon without a sulphite salt, reflecting much credit on the photographer, Mr. A. Peebles Smith. Much praise is due to the engraver, Mr. I. M. Van Ness, who translated the photographic half tones into line and stipple with skillful hand.

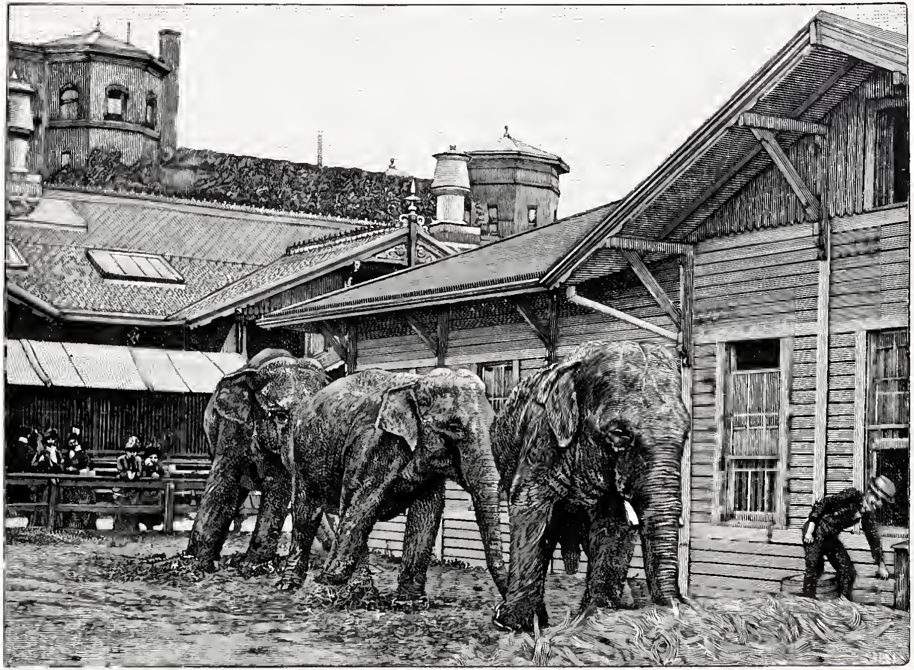
As a whole we represent with this illustration a happy combination of the photographers, with the engraver's art, and it must be said also with that of the electrotyper, who by the galvanoplatic reproduction of the original engraving has enabled us to print an edition of 12,000 copies from one plate.

GOOD ADVICE.

Talking recently with an old photographer, the question was asked, "why the present army of amateur photographers, of both sexes, steer clear, in such a marked degree, from the most interesting branch of photography, namely, that of stereoscopy."

The solution arrived at, was that not one amateur in a hundred of the present generation knows anything about the stereoscope, or cares, so long as he is permitted to plod along the well-beaten path in which he started.

Probably little can be written on the subject that has not already been said over and over again. Nevertheless, that



Photographed by A. Peebles Smith. IN CENTRAL PARK. I. M. Van Ness, Engraver, N. Y.

should not prevent him who knows the immense superiority of the combined pictures, as seen in the stereoscope, from reiterating it until the amateur of our time wakes up and consents to give the subject the attention it deserves.

I say *amateur* photographer, because it is through him—if at all—rather than the professional, that this branch of photography is to be revived and brought again into the popular favor it once held.

It illustrates in a striking manner how the amusements and fashions of one generation are ignored and lost in the next. Thirty years ago every well-to-do family possessed a stereoscope, admired it for the wonderful beauty it brought out in the pictures, and honored it for the scientific truth which it revealed and illustrated. To-day the average citizen does not care enough about the instrument to think of the pleasure it is capable of giving, or knows about the principles on which it is constructed. When asked if he is familiar with, or has ever seen a stereoscope, his reply will most likely be, "Oh yes, I remember we used to have one in my father's house, and a lot of pictures were with it, but it is so long ago that I had forgotton all about it."

Now I wish to repeat and emphasize the fact, that it devolves upon the amateur photographer to re-establish the stereoscope upon the plane it once occupied. To enable him to do this, he must first know the instrument and its capabilities well enough to be convinced of the infinitely greater pleasure and satisfaction there is in seeing a slide through the stereoscope, than in merely looking at a single photograph, of whatever size it may be. In the one case the objects seen in the combined pictures, assume a solidity and naturalness that is startling. If it be a landscape, every tree, post, flower, or figure in the foreground, becomes a literal fact.

The depth, thickness, distance apart of each and every object, is as though the reality was being observed, and not merely a picture. The *combined* pictures afford interest greater than that of the single picture, not only because of the apparent reality, but also because there is more to be seen in them. Objects obscured by reason of insufficient illumination, or for other causes, such as crowded juxtaposition, or similarity of form and tone, are overlooked in the single view; but when, in the stereoscope, the two pictures are merged into one, they stand out and assert themselves in a way not to be believed without ocular demonstration.

What is required for stereoscopic work? First of all, a 5x8 camera, but let me make the dreadful announcement that *two* lenses are necessary for the camera. If the amateur be not utterly crushed by this fact, then all the rest is plain sailing, and as simple as the methods to which he is accustomed, until mounting the prints is reached.

To make a simultaneous exposure with two lenses is as easy as to make it with one, and both being on one plate are as easily developed. The printing and toning are the same. The cutting out and mounting require care and exactitude; but that is amply repaid by the surpassing interest in the finished slide. This is not the place to enter into details. The amateur must first get his 5x8 camera properly fitted with a pair of matched lenses, and without aspiring to grand scenery or lofty mountains, let him confine his attention to little bits along any country road; fence corners with broad-leaved weeds, docks and mullins growing therein, groups of hollyhocks, or the stately sun-flower in his own or his neighbor's garden, and my word for it, when these homely bits are once seen in the magical stereoscope, the interest in the twin pictures will rise to the level to which it belongs.

In conclusion, let me say, that two *similar* pictures from one negative, even though they be mounted in stereo fashion, will not produce the desired result; for the reason that the two pictures must be *dissimilar*, precisely as the image upon the retina of the right eye differs from that upon the left—slightly, it is true—but yet an essential difference.

W. H. Metcalf.

STEREOSCOPIC WORK.

Now that the revival of the stereoscope is an accomplished fact, and on the principle that "a good thing will bear repetition," it is thought that a page from the book of one who has practiced this branch for some years may be interesting to those who are contemplating the commencement of this interesting and valuable development of photography. Many of the members of the Amateur Photographic Association of Victoria do a large amount of this work, the present President confining himself almost exclusively to it. He has devised a camera which is quite unlike any other that I have ever seen, the working parts being so simple that it can be set up in a few seconds. If the lenses which are in position are not of the correct focal length for the work in hand, a pin is touched and a pair of either greater or less focal length substituted, in a second. If a time exposure is required everything is in readiness, should it be thought desirable to make a quick shot, turning a button releases the instantaneous shutter apparatus bodily and it is in position for work. It is the simplest camera made (considering the range of work which can be done by it). When the exposure is made, the tail-board is closed and secured with a spring catch, a similar door closes the front portion, thus protecting the lenses—which are never unscrewed. There is no case to stow camera away in, it being a waterproof case of itself when the before-mentioned doors are closed. Five double backs in a box are carried inside the camera body, and thus take up no more room than the camera does. It is used with an Alpenstock Tripod. Several of us use the 8½x6½ camera producing two stereo. negatives on each plate. I have had an extra front adapted to my 8½x6½ camera, which contains a pair of Ross' Rapid Symmetricals at one end, placed three inches apart, which, after the view on the top half of the plate has been obtained, merely requires drawing out and reversing, and is then ready for the exposure of the lower half. Most whole-plate cameras of English make have an elastic curtain, which may be fixed on the inside for the purpose of taking two photographs on the one plate; this is inserted in our cameras in the usual manner, and an additional division formed of a piece of blackened cardboard is fixed in a small saw-cut in the wooden support of the flexible curtain, and in a corresponding notch in the frame of the camera. When the top half has been exposed, this card division is removed and fixed similarly in the lower portion until the bottom half has been exposed.

There is no need of being particular about filling up the spaces between the edges of the large curtain and the sides of the bellows of camera, nor those at the edges of the card division and the curtain, as no light which comes through will affect a plate—it has never done so in my camera. Neither is it necessary that the card division extend through to the front of the camera; so long as it is arranged to be as near the shutter of the dark slide as possible without touching; the other end need be extended only so far as is necessary to prevent the direct rays from one lens trespassing on any portion of the plate belonging to the other lens. For ordinary exposures I use a common flap shutter, which ensures the same exposure being given to both lenses, and for quick work use the common drop shutter, the motion of which is accelerated by an elastic band. On arrival in the dark-room the plate is cut in half on a cutting-board, provided with slips of wood so arranged that a plate can be cut accurately in the dark if necessary. The development is as usual, only care must be taken not to get the negatives hard, in fact, if anything they should err on the side of softness; no matter whether they look well or not, to the naked eye, when the stereoscopic effect is obtained, that which before looked flat and weak suddenly becomes imbued with life, and its dullness is gone.

The most particular point to be observed in the production of stereographs is care in the cutting and mounting. This, if not done with the greatest judgment, will render the slide entirely useless. The camera must, at any rate in architectural work, be levelled or the focusing screen kept vertical and it will save much trouble in cutting, if the sides are kept vertical also, as if the latter be not attended the same appearance will be presented, as is noticed in an ordinary architectural view, in which the lines of the building may be vertical, yet the sides of the print are not parallel to them, and the building appears to be falling to one side of the picture, unless the correction be made in cutting. Any prints which present this peculiar appearance may be trimmed perfectly and without trouble by making use of a pair of metal frames, or by using two distinct cutting glasses, each of the size of one portion of the stereo. print, and having a parallel slip between, so as to separate the glasses to such an extent that their centres will be the same distance apart as the centres of the lenses in the camera are placed. Another point which requires attention is the width of the prints. The majority of the commercial stereographs are cut far too wide, and as a matter of consequence the centres of the prints are farther apart than the eyes of the observer. When this is the case the eyes can no longer examine the print through the stereoscope in an easy manner, the operation requires a strain, and after a few have been inspected, becomes fatiguing; this is one of the causes which led to the decline of the stereoscope years ago. Many of the slides have the pictures three and a quarter inches from centre to centre, now three inches is as much as should be ever permitted, and even this is too far for some eyes. I make it a rule to mount my prints two and five-eighth inches apart and am amply repaid for the loss of a little of the subject by the ease with which I can examine a larger number of proofs.

In order to get the most out of the prints they must be burnished, in order to bring out the details and subdue the grain of the paper. Some of mine I have enamelled, and for some subjects it is well worth the trouble.

The most satisfactory method of inspecting a stereoscopic subject is when the print is in the form of a transparency on glass, and for all who do this work I would highly recommend that method for the pictures which they desire to retain for their own stock, reserving the making of silver prints for those which they wish to give away.

The printing of the transparencies is more expensive and troublesome than preparing paper prints; it also necessitates the employment of a specially constructed frame, but the results fully justify the extra work undertaken.

J. H. Harvey.

ARISTO PAPER.

I earnestly recommend to amateurs, the use of ready-sensitized aristotype paper for making prints, because I regard it as infinitely superior to the prepared albumenized paper sold by dealers. It keeps well in a dry place. Some samples curl badly in the processes subsequent to printing, and such should be avoided. Paper that does not curl can be readily obtained. Excellent and durable proofs can be obtained by simply making a slightly over-printed print, and fixing the same in hypo without toning. For making finished aristotype prints I have employed the following method. It is very easy, and the results are most satisfactory in every way.

Liesegang's combined toning and fixing bath for aristotype prints, is as follows:

A	Water	24 ounces
	Hyposulphite of Soda	4 ounces
	Common Salt	1 ounce
	Powdered Alum	4 drams
	Sulphocyanide of Ammonia	2 drams

Mix the above, and shake well a few times at first, then allow the solution to stand for ten days, and filter the clear supernatant fluid without disturbing the sediment.

B	Water	3 ounces
	Chloride of Gold	15 grains

C This solution is simply A and B after having been combined and previously used. It keeps well and should be preserved in a separate bottle.

Directions for Use.

Take 2½ ounces *A*, add to it 1¾ ounces *C*, then add 2 drams and 20 minims *B*. Mix in order named, not otherwise.

First well wash the prints in several changes of water, to eliminate the free silver, and then immerse in the bath. Ten minutes in the bath will give a red color, fifteen minutes a splendid brown, and twenty minutes a fine brownish violet. The prints will tone more quickly if they are taken out of the bath and laid flat upon a clean surface. They continue to tone in the air. When the desired color is reached, wash thoroughly in water as usual with albumenized paper.

Aristotype prints become darker after they are dry, therefore care must be observed not to carry the toning process too far in the bath. Experience alone will teach the proper time for their removal.

At the outset, before any of the used bath, or C, is at hand, take 4 ounces A, and add 3½ drams B, which will give a bath that should tone about two dozen cabinets before more gold is required, whether the prints are toned the same day or not. Preserve this for future use as C. In general it may be said, that for the small number of prints usually toned by amateurs, C alone may be used until results show that it contains too little gold to be effective, then strengthen with A and B, as stated at first.

John D. White.

METHOD OF ENAMELING PHOTOGRAPHS.

First prepare as many glasses as you are likely to require.

A very useful size is 9x12½ inches, as the different sized prints can be got on without waste of enameled surface. Having a number of glasses enables one to fill a large order quickly. Select glass free from scratches or bubbles. Plate glass is, of course, best. Rub the glass with a solution of best yellow wax, five grains; in benzole, one ounce; applied with a pad of tissue paper. Then with another pad rub it off and polish with the palm of the hand, and polish finely with tissue paper and French chalk.

New glass will need treatment several times before it is suitable for receiving the print; afterwards one treatment will do. The glass must *never be washed* after stripping, but kept out of the dust, and any bit of film left on the margin shaken off before rewaxing.

Edge the plates with gelatine solution and coat them after dusting with enamel collodion made thus:

Gun cotton	48 grains
90 per cent. alcohol	9 ounces
Ether	5 ounces
Castor oil	a few drops

Put away till set or till all are coated; then flow over in the same manner the warm *gelatine solution* previously filtered through flannel.

Nelson's No. 1 gelatine	1	ounce
Water	8	ounces
90 per cent. alcohol	2½	ounces
Glycerine	16	minims

Soak the gelatine first, then warm and filter; coat plates and set out of dust to dry; they can be prepared at odd spells and are ready at any time.

Lay your prints on out of the water, and squeegee down and get out all air bubbles. Lay away to dry, and when *perfectly* dry cut around the glass about an eighth of an inch from the edge and the prints will leave the glass, enamel and all. Then trim to size and mount.

In mounting apply the same gelatine solution with a small sable pencil just around the print, and on the back lay on the cardboard and press between two glasses with heavy weights, or a better way, and particularly if you wish to raise the centers in medallion or arch top (same as your cut-outs in printing), make some wooden blocks with raised centers the shape you want, and a follower with opening the size of raised center, held in place by guides. Place your mounted print in between these blocks and put in a screw press for half an hour. In raising the centers it should be done before fastening to the card.

These instructions seem lengthy, but with a little practice the process is very rapid and easy to work.

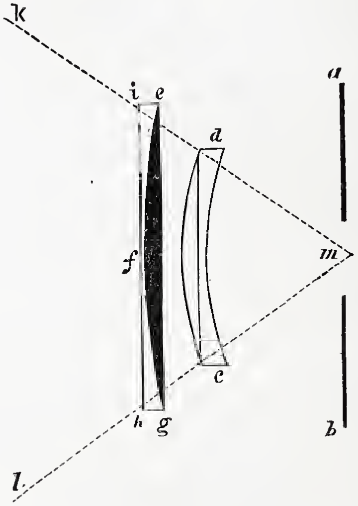
J. H. Reuvers.

THE COMPENSATOR.

WITH wide-angle lenses a decrease of brightness from the centre of the field of vision toward the margin is quite perceptible. This fault, the cause of which must be looked for in the construction of the lens, becomes more objectionable as the diameter of the field of vision is increased.

With a lens taking in an angle of 90 deg., for example, the intensity of the marginal rays is but one-quarter of that of the central rays. If, therefore, the centre of the picture has been sufficiently lighted, the margins must be under-exposed, and when the margin has been correctly exposed, the centre must inevitably be over-exposed. For this reason it is impossible sometimes, and particularly with interior views, to utilize the otherwise completely sharp picture circle or disc to its fullest extent. The advantages offered by wide-angle lenses become thus illusory.

Remedies for the evil have been repeatedly proposed which principally are methods of depressing during exposure the forcible action of the central rays in favor of those passing through the margin of the lens. The so-called star-stops attached to the front of the objective, and kept vibrating during exposure have been frequently employed for the purpose, but independent of the difficulty of attaching them properly in the hands of operators of but limited experience, they have given very imperfect results, because of the impossibility of judging correctly of the required time for their action.



a. b. The stop. *c. d.* Front lens. *h. i. e. g.* Compensator. *c. f. g.* Smoky glass lens, (plano-convex). *i. e. f. g. h.* Crystal glass lens, (plano-concave). *l. m., k. m.* Marginal rays.

I have endeavored to remedy the evil by optical means, which I will briefly describe. The very simple apparatus consists of two extremely thin glass lenses, one of them being plano-convex, and made of smoky glass; the other plano-concave, and of equal curvature, is made of plain crystal glass, and the two so connected together as to form a parallel plate acting the same with incident light rays as a plane parallel glass plate. By looking through this lens combination the margin appears to be like colorless glass with a gradual increase of darkness towards its centre. The glass plate when properly mounted and attached in front or back of the objective lens, will, when the smoky glass has been well selected and is of the requisite curvature depress the action of the central rays so much as to make them equal to the rays passing through the margin.

To attach the compensator to the wide-angle lens it becomes necessary to measure the distance from the stop plane to the poles of either the anterior or posterior lens, and to have the diameter of the compensator form the basis of a cone projecting from the centre of the stop, as shown in diagram.

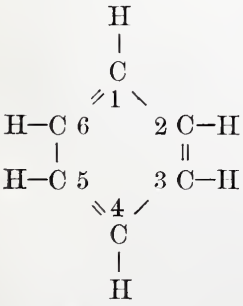
To make it more distinct the thickness of the Compensator is represented much greater than it is in reality.

In exposing with a wide-angle lens it should be borne in mind that the margin must have ample time given to it, and therefore two, three, and five times as much time with the compensator as would have been sufficient without it. The effects are really astonishing, and will convince every one of their superiority over exposures made without the compensator. With it, a wide-angle lens can be used to its full capacity.

A. Miethe.

THE WONDERFUL BENZINE RING.

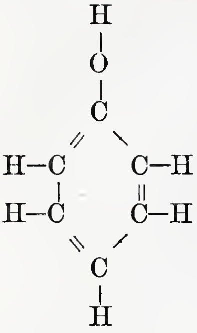
WHEN coal-tar is distilled, a liquid known as naphtha, composed of benzine (benzole) and toluol is obtained. Many interesting and valuable products having been derived from both of these constituents by acting upon them jointly and severally by various reagents. Prof. Kekulé, of Bonn, made a special study of the subject, and concluded that the carbon atoms in the benzine molecule (C_6H_6) are arranged in the form of a ring, and that the hydrogen atoms are symmetrically attached to them. Of course, it is improbable that the molecule is flat, as we must represent it to be by our diagram and symbols, still its form is such that this correctly presents its wonderful qualities and possibilities.



Benzine Molecule.

Since hydrogen is always a monad, it must be connected by one bond, while carbon, being a tetrad, has four bonds to be saturated either by combination with atoms of other elements, or by union with other carbon atoms as shown in the diagram. We have numbered the corners of this hexagonal figure or ring, because when other elements or compounds take the place of two or more of the hydrogen atoms, it makes a great difference at what part of the ring the substitution is made.

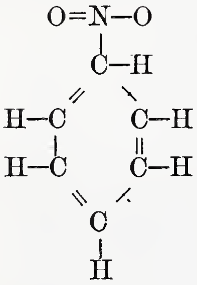
If we substitute this group of atoms —O—H, known to chemists as hydroxyl, and in commerce as per-oxide of hydrogen, for one atom of hydrogen, we obtain the very useful antiseptic phenol or carbolic acid.



Carbolic Acid.

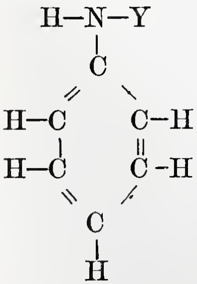
If, however, benzine is acted upon by strong nitric acid, an atom of hydrogen is displaced by this group of atoms NO_2 (nitryl), giving a molecule shown in the diagram and known as nitro-benzole. This compound is an oily liquid having the odor of oil of bitter almonds, but is in no other way related to that substance.

When nitro-benzole is treated with a proper reducing agent, of which there are several equally effective, aniline is formed, and this, when subjected to the oxidizing action of chromic acid gives rise to hydrochinon, which is simply the benzine molecule minus two atoms of hydrogen and plus two molecules of hydroxyl (-O-H).



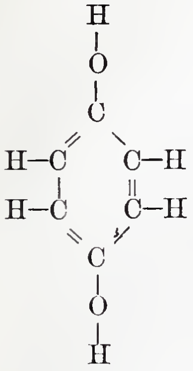
Nitro-benzole.

It will be observed that one group of hydroxyl is at the top, and the other at the bottom, or at positions 1 and 4, as marked in the first diagram. Now it is a curious fact, that if the bottom hydroxyl group had been put into position 2, the resulting compound would not have been hydrochinon at all, but pyrocatechin, a compound having many peculiar properties. If, however, the hydroxyl group at No. 4 in hydrochinon had taken its position at No. 3 in the ring, the product would have been resorcin, a compound differing in many respects both from pyrocatechin and hydrochinon. The three compounds, hydrochinon, resorcin and pyrocatechin differ from each other in crystalline form, solubility, melting points, taste, etc., and yet have precisely the same elements in the same proportions. This "orientation" of the benzine molecule, is not confined to the hydroxyl group, but obtains when many radicals, as NO_2, are substituted for hydrogen atoms. Consequently chemists have adopted prefixes to designate the positions occupied by the groups of the agent substituted. Thus among

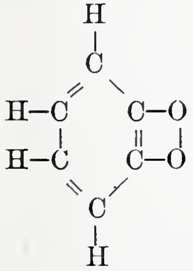


Aniline.

the disubstitution products, if one group occupies position 1 and the other the position 2, the compound is "ortho" as ortho-dihydroxy-benzine or pyrocatechin; but if one group is located at 1 and the other at 3, then the compound is "meta," as metadihydroxy-benzine or resorcin; while if one group is at 1 and the other at 4, the compound is "para" as para-dihydroxy-benzine or hydrochinon.


Hydrochinon.

By the loss of an atom of hydrogen hydrochinon becomes quinhydrone, and this, by the loss of another atom of hydrogen, becomes quinone. This loss of hydrogen may occur from ordinary oxidation, or it may, and probably does occur, during development by the hydrogen uniting with the bromine of the silver bromide thus setting the silver free. The lost hydrogen may be restored by the action of sulphurous acid (H_2SO_3) which desiring to become sulphuric acid (H_2SO), decomposes water (H_2O), taking its oxygen and setting hydrogen free, or rather turning it over in its narscent state to the quinone from which, first quinhydrone, and then hydrochinon are reproduced. This restoration, to some extent at least, no doubt occurs during the process of development when sulphurous acid or the sulphites are employed, as is the usual custom in hydrochinon developers.


Quinone.

Finally it is interesting to note, that our old friend pyro is also a member of the great benzine ring family, and differs from hydrochinon in composition only by having one more group of hydroxyl in place of an atom of hydrogen around the carbon chain.

H. D. Garrison.

ON WHITE-LIGHT DEVELOPMENT.

In response to your request for an article for the "Annual of Annuals," a few lines explanatory of the detail and *modus operandi* in the development of negatives by white-light given in an article by Mr. E. L. Wilson, in *Wilson's Photographic Magazine* of July 6, 1889, may be acceptable:

* * * * * * * * *

"At the appointed hour we stood beside the learned doctor while he accomplished, over and over again, all he had agreed to do. A Seed plate of the highest sensitiveness was placed in a holder in contact with a glass positive of Raphael's *Madonna*, and exposed one second, at ten feet distance, to a gas-flame. The developer having been previously prepared, the plate was immersed in it, and allowed to remain covered two minutes. The covering was then removed, and with no non-actinic glass interposed (the gas-flame—an Argand burner—turned on full head) the development went on, only the shadow of the doctor's person intervening between the plate and the gas-flame. When the image now began to appear we watched closely for the rays of fog to shoot, aurora-like, across the plate, but there was no intrusion of that kind. The gas-burner was pulled over to the full extent of the bracket, where all the power of the light might be received upon the coming image, and the image continued to come. Then the dish was carried to the next room, where a stronger flame was burning, and placed upon a table four feet distant. No fog. No doctor's body was interposed; on the contrary another gas-flame was lighted at a like distance and the development went leisurely on 'between two fires,' so to speak. The query came to our mind: "*Will* a gas-flame fog?" Or, again, has our friend turned alchemist and by some invisible persuasive fume drawn the poison from the fangs of the fog-producing light and rendered it harmless? Now, one flame was four feet away from the plate and another gleamed over it. There was no fog, but the plate had been developed into a blooming negative, and seemed to be waiting further orders from its master. It was next held within a foot of the larger gas-flame, and after at least five minutes the streaks of fog began to chase over it until its usefulness was gone. In a second experiment the developing dish was brought out at once to the two lights a foot or so away. We looked for a fine display of "northern lights" there, but fifteen minutes elapsed before the streaks came. A third experiment was the development of a plate in a glass cell, in full light, only a ground glass being interposed for its diffusion: no fog. Thus it will be seen that the interesting operation of development may be exhibited to an audience fearlessly, and on any scale, without trouble.

"Here is a discovery which will prove a great boon to many people, and save lots of good eyes from destruction if it is followed. Exposed plates can be handled almost recklessly, and the development of them made a luxury instead of the great trial it is to those who must develop their plates after the hard work of the day.

"'And what is the composition of this light-defying mixture?' we hear you say. On the word of our generous friend, it is nothing but that well-known mixture of iron and bromide and potash, known as the 'ferrous oxalate developer,' a developer yielding the very finest of negatives, staining neither hands nor plate; a developer which, as Dr. Higgins also says, when understood is always treasured as a 'bosom friend.' In its use as now made known, there is a luxury in development almost inconceivable. Development here is not a matter of guess-work by 'darkness made visible,' but one of leisurely inspection and judgment. You may all do as we have described, and thank Dr. Higgins for telling you so."

For at least five years, during which time I have developed up to even thousands of negatives, I have pursued the course here given, making use of neither dark-room or non-actinic light of any kind. The plates used have been the most sensitive attainable, and the exposures both instantaneous and timed, and to have a foggy plate is something I have never known. Such results demand, of course, that the plate be uninjured up to the time of development, and to secure this, absolute perfection of camera and plate-holders is one of the requisites. This each individual must personally see to himself, taking, as in my advice to the "Novitiate" in your preceding Annual, "nothing for granted." Next the opening of the plate-boxes—the insertion of the plates into the holders and their removal therefrom for immersion in the developer must be in darkness—total darkness.

The plate now having seen (the word I presume is pardonable) no light, except that incident upon exposure to view or object, can only fog from having been so sent out by the manufacturer, a very rare occurrence, or from the development. In the latter case, the cause is either in the composition of the developer, or from the light made use of in the development. Make certain, therefore, *ab initio*, that your developer is all that can be asked of it, and then having filled out into your developing tray such quantity as will be sufficient to cover your plate one-eighth of an inch deep, neither more or less (for this there are good reasons), remove your plate from the holder and slide it into the developer, giving at once several rocking motions to the tray to insure wetting the film evenly over its entire surface, and the removal of air-bubbles, and cover over the tray. So far in absolute darkness, and let the plate remain for two or three minutes. You can now lift the cover and examine with a fairly strong white-light, one that is all that you desire for the purpose. Re-cover, for, say five minutes or more (a normal exposure will average about fifteen minutes for ferrous oxalate development), *pro re nata*, and re-examine, using any amount of light, until satisfied that the development is finished.

An instantaneous or insufficient exposure will require considerably more time than one that has been normal, as also will each succeeding plate in the same developing solution. By this method your negative is a creation of your own personal skill and judgment, and not of chance (i. e. as far as the matter of development goes) for it is of *"the things that are seen and not of the unseen."*

Accustomed thereto, no amount of either coaxing or driving will again force you into the gloom and incertitude of that *bête noir* of photography, the dark-room. Freed from its prison walls, the most enjoyable part of the art, the watching of the image, as born from the invisible it assumes proportions and becomes a reality, is yours, and with it a facility for development most complete.

J. J. Higgins, A.M., M.D.

A REMINISCENCE OF DEVELOPMENT.

Last week I found myself "doing a tour" with my friend, Mr. C. H. Bothamley, a spouse, and two cameras, in one of the most delightful districts in England, Monmouthshire and the valley of the Wye. My business, however, is not to describe scenery, but to write about photography. As a rule, I am not given to shooting off plates in a harum-scarum way, but this time I did it, and did it thoroughly, for in six days of work I exposed 120 medium size and about twenty 10 x 8 plates. This requires explanation, and the fact is I went to the country not so much to make pictures as to investigate certain claims made by friend Bothamley in favor of "orthochromatic," as he calls it, "color correct," as I prefer it, photography, for landscape work. My business at present is not with color-correct photography any more than scenery; I wish to describe how I develop my negatives so as to run the least risk of totally spoiling any plate, and to have the best chance of bringing out everything that was in my plates. Mr. Bothamley has at various convention meetings* shown results with the intention of comparing ordinary with color-sensitized plates, and I have on each occasion heard good workers say that more might have been got out of the ordinary plates, chiefly by more exposure, and I don't mind confessing that I held that opinion to a certain extent myself. Clearly, therefore, my "cue" was to give all my plates, dyed and ordinary, as much exposure as I dared; equally clearly I was in danger of over-exposing all my plates, especially as I had practically no experience of any of the batches I carried with me.

The plates were: A batch of slow, density-giving landscape plates; a similar lot, but much more rapid; some slow plates dyed by myself with ammoniacal erythrosin, and some commercial plates prepared under the Tailfer Patent and called

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*See the paper on "Orthochromatic Photography with Gelatine Plates," by Prof. C. H. Bothamley, page 473, September 20th issue, 1889, of *The Photographic Times.*—Editor of The Annual.

"Isochromatic" by the maker. The last are frantically rapid when used without a yellow screen. Still further to complicate my experiments I used two yellow screens, not exactly alike in depth.

When I looked over my note-book I realized that all my plates looked as if they must be fully exposed; when development began it became evident that nearly all were over-exposed, and the *crux* was to get all the details possible without fogging the plates.

I made up my usual ten per cent. solutions of pyro with meta-bisulphite, bromide, and liquid ammonia. (I felt bound to use pyro and ammonia in order to follow Mr. Bothamley's experiments honestly. I could easily have made good negatives right off with carbonates, especially that of ammonium.) Farther on I made a twenty per cent. solution of the mixed citrates of soda and potassium.

Let us suppose the dose of developing solution required for one of the smaller plates to be three ounces. Development was started with pyro two, bromide two, ammonia two grains or minims per ounce of developer. At hand was a dish containing a three grain to the ounce solution of bromide, and there was also a measure containing two drams of the twenty per cent. citrate solution, equal to twenty-four grains of the citrates.

Another matter to be considered was that I had no time for very prolonged development, such as might have been carried out by adding alkali a minim or two at a time; my engagements forced me to "hurry up," and prolonged development would have vitiated the comparison with Bothamley. As a matter of fact I developed twenty-nine negatives the first day, working six hours, and lost one presumably because a mistake had been made as to stops in the lens.

If the image came up deliberately and with reasonable density of high lights as in some cases it did with my somewhat abnormal developer, all that was necessary was to wait till full density was obtained, say in four minutes, once or twice a few minims of ammonia were added. But, as a rule, the image came up hurriedly and gray. If one could not diagnose absolute fog I waited till all detail was up and then instantly poured into the dish the citrate solution, making it mix well with the developer. After a minute or so I added to each ounce about one minim of pure ammonia (ten minims of ten per cent.), and went on so doing from time to time till full density was apparently obtained. This usually occupied about three minutes. These are among the best negatives, every detail is present, over-density in some cases, which will be reduced with ferricyanide and hypo in the usual way. This citrate system is due to Mr. G. W. Webster, and is valuable beyond description. It is a great mistake to add bromide along with the citrate; the bromide keeps back density to a great extent, and after details are all out bromide is useless as regards them. The citrate seems to prevent fog, and allows the density-giving quality of the alkali to act, to what extent I do not know, but enough for any purpose.

If the image presented an indubitably foggy appearance the plate was instantly, without washing, popped into the dish of three grain bromide, where it was left for a couple of minutes. Then without washing it was put back into the original developer, in some cases with a little bromide added. Negatives so treated are either good or too black and white. Most of them are decidedly good.

In one or two cases I felt sure of great over-exposure before I began to develop. These I put into the bromide solution first; all the negatives so treated are on the *hard* side of perfection.

Had I been at liberty to develop in any way I pleased I should have used sodic or potassic carbonate with bromide, or ammonic carbonate alone. The latter is a splendid alkali for such a case, but seems feeble and is slow in ordinary cases.

If I had any known case of under-exposure I should develop with *eikonogen*, which certainly has an astonishing developing power. *Quinol* (hydrochinon) is very useful, and works well with caustic alkali on dyed plates, but it is doubtful whether it is a desirable reagent for landscape work; personally I do not like it for that class of subject.

Andrew Pringle.

BABYHOOD.

It is difficult to say which is most admirable in this exquisite little picture—the artistic instinct of Mr. Havens, or the mechanical skill and perfection of process-work displayed in the reproduction.

The pose is simple and artless, reminding one of the painted and carved cherubs so often and so lovingly treated by the early Italian painters and sculptors.

Just such a head as this, with its pure, sweet profile, its innocent eyes and silken hair on which the light makes aureole, would have delighted the heart of Sandro Botticelli or Luca Della Robbia. But without touch of brush or chisel,

BABYHOOD.

O. PIERRE HAVENS, PHOTO.

PHOTO-GRAVURE CO. N.Y.

with sensitive plate instead of canvas or marble, to-day we harness the sun to do our work. The photographer is to be heartily congratulated on his success—the graceful position, the fortunate expression, the broad treatment of the hair and the skillful way in which the ear is subordinated.

None the less does the Photo-Gravure Company, whose work the reproduction is, deserve the greatest credit for the exquisite character and delicacy of workmanship displayed in the print.

It may be necessary to point out to some of the less observant of our readers that there is a tinting of the flesh and hair, resulting from a double printing, which gives it all the charm of nature itself. This process is a specialty with the Photo-Gravure Co., whose president, Mr. Ernest Edwards, is one of the pioneers in process-work, and is enjoying at present a well-earned success in this line.

EXPLANATION OF TABULATED SHEET OF QUINOL AND PYROGALLOL DEVELOPERS.

The accompanying tabulated sheet gives the exact number of grains of each component part, contained in one ounce of made-up developer, for the purpose of ready inspection and comparison. But it is to be distinctly understood, that the method and manner of compounding and using the developers, as recommended by the various persons whose names are used, is not here given or attempted. For this reason, the tabulated sheet can be more intelligently studied, after reading the original presentation of the several developers.

The quantities in columns 5 and 8 (water) are partly arbitrary, but give an idea of the general average: the sum of the two columns in the same line, always equalling one ounce.

Probably all the developers given, have proved good working formulæ. For normal exposures, the writer can vouch for the good qualities of "Average No. 1," which may be taken as the usual type of Quinol developer, though for underexposure development may begin with much less Quinol and Carbonate Potass than shown.

"Average No. 2" is a general average, and is the type of developer as given by Newton and Baltin, though "Average No. 4," is recommended instead. Newton's and Baltin's are each presented as being particularly efficient for very short exposures, and quick development. When it is remembered that the authors of these developers, are widely separated, and

QUINOL DEVELOPERS.

1 oz. QUINOL DEVELOPER, NAME. By	Quinol.	Sulphite Sodium.	Citric Acid.	Bromide Potassium.	Water.	Carbonate Potass.	Caustic Potass.	Water.	Line Num.	REMARKS.
COLUMN NUMBER	1.	2.	3.	4.	5.	6.	7.	8.		
F. H. ROSENGARTEN, American Annual, 1889.	grs. 4¾	grs. 22½	grs.	grs.	min 180	grs. 12½	grs.	min 300	1	
KLEFFEL, " " "	4-5	24			240	30		240	2	
A. A. ADEE, " 1888.	6	46			236	25		244	3	
C. E. VON SOTHEN, " 1889.	6	30			240	15		240	4	
J. CARBUTT, " " "	7	35			350	17		130	5	
C. EHRMANN, " "	3¾	15			240	22½		240	6	
H. J. NEWTON, Anthony's Bulletin, 1888.	5	30			300	22½	5⅝	180	7	
JEX. BARDWELL, " "	2	8			80	20		400	8	
M. MERCIER, " "	2	18			360	11		120	9	
P. BALTIN, " " "	4	31			240	46½*	6	240	10	* Omitted from Average No. 1.
W. HANSON, " "	4	16		16*	240	0	4	240	11	* Not used in averaging,—it constituting a special developer.
R. W. THOMAS & CO. "	4	24	1½	¾	240	0	4	240	12	
J. W. SWAN, " "	2	6	¼	¼	360	0	4	120	13	
British J'n'l Ph'g'y, 1889.	4	24	1½	½†	240	37*		240	14	† Given as Bromide Ammonium. * Omitted from Average No. 1.
TOTALS....	59.3	329.5	3.25	1.5	3540	259	23⅝	3174		
Average No. 1.	4¼	23½			253	19½		227		Columns 3, 4 & 7 omitted.
" No. 2.	4¼	23½			253	23½*	4¼	227		Columns 3 & 4 omitted. * = 259 ÷ 11.
" No. 3.	3⅓	15⅓	⅞	½	280	0	4	200		Average of lines 11, 12 & 13, only.
" No. 4.	4½	30½			270	34½	5¾	210		Average of lines 7 & 10 only.

that the entirely different manner of compounding, precludes the idea of a common origin; the similarity between the two seems remarkable. The only practical variation is between the quantities of Carbonate Potash as given by each, and Newton says the quantity given by him may be increased without detriment.

"Average No. 3," is a type of the Quinol and Caustic Potash developer. Other averages may be made, as desired. By the aid of the table, any developer may be readily made up for a single trial.

Perhaps it would be of assistance to some, to show how to prepare any desired number of ounces of developer of those here given. The following method is suggested, and an example worked out in full detail. This will seem superfluous to many; but it has been the experience of the writer, that where help in such matters was wanted at all, it was wanted with respect to the smallest details. In the first place, it is necessary to have separate solutions of all the ingredients. (After settling on any particular formula, some of the ingredients may be combined). It is well to make the solutions as concentrated as possible without approaching too near the saturation point, and endangering their clearness. The table of solubilities in THE ANNUAL is the best guide for this purpose. The strength of the solutions may be marked on the labels, thus, Carb. Soda 1 in 5, which indicates that for every ounce of carbonate soda, there are five ounces of solution. Suppose solutions made as follows:

Pyrogallol	dry, to be weighed, or in 2 gr, tablets
Sulphite sodium	1 in 5 (A)
Sulphuric acid	commercial article, C. P. (B)
Bromide potassium	1 in 10 (C)
Carbonate potassium	1 in 5 (D)
Carbonate soda	1 in 5, &c., (E)

Suppose it is desired to make up 4 ounces of developer (pyro) "Average No. 3," multiply each item as there given, by 4, and set down in order, thus:

Pyro, 4×4=16 grs. weigh out or measure, (=8, 2 gr. tablets)
Sulphite soda, 18×4=72 grs. × (A) 5=360 mins...360 mins.
Sulpheric acid $\frac{1}{6}\times4=\frac{2}{3}$ grs. put 1 drop of (B) in
Thirty drops of water, use of this.................. 20 mins.
Bromide potassium, $\frac{3}{10}\times4=\frac{6}{5}$ grs.×(C)10=12 mins. 12 mins.
Carbonate soda, 16×4=64 grs.×(E) 5=320 mins...320 mins.

Total solution..........712 mins.

This will be the guide to follow in making 4 ounces of developer. The order of preparing may be as follows: Pour

360 mins. of A into graduate, into this pour the 20 mins. of B (diluted as directed), put in and dissolve the 16 grains pyro, then add the 12 mins. of C, and the 320 mins. of E. There will now be in the graduate slightly more than 712 mins., the dry pyro having caused the increase in bulk. Suppose it to have increased to 720 mins. or 1 oz. 240 mins. Now as this contains the proper quantity of each ingredient for 4 ounces of developer; subtract 1 ounce 240 mins. from 4 ounces, and you find that the quantity of water to be added is 2 ounces and 4 drams. It would be a great convenience, and assistance to amateurs, (and others), if the manufacturers of dry plates, would put in with their plates, instead of the formulæ for a

PYROGALLOL DEVELOPERS.

1 oz. PYROGALLOL DEVELOPER BY NAME.	Pyrogallol.	Sulphite Sodium.	Sulphuric Acid.	Sulphurous Acid Water.	Citric Acid.	Bromide Potassium.	Water.	Carbonate Potash.	Carbonate Soda.	Sulphite Sodium.	Water.	Line No.
COLUMN NUMBER	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	
CHAS. EHRMANN.	1⅞	15					240		15		240	1.
M. A. SEED, Dry Plate Co.	3	18					240		12		240	2.
COOPER.	5	40					240		20		240	3.
JOHN CARBUTT.	2 7/16	9¼	2/13				300	5	10†		180	4.
G. CRAMER.	5	⅝	⅐				30		10½	A42	450	5.
BLAIR CAMERA CO.	4½	18	3/16			3/32*	240		18		240	6.
HARVARD DRY PLATE CO.	2 2/9	4 4/9			2/7	⅑††	240	9		4 4/9	240	7.
CHAS. EHRMANN.	4	16			½	⅔	240	12		10	240	8.
BEACH.	7½	30		85			85	26		17	310	9.
PHOTOGRAPHIC TIMES.	4	16		16			40		26	⅔	424	10.
" "	3 3/7	13½		13 5/7			34 2/7	14		1/17	432	11.
TOTALS.	43	223 181§	½	115*	4/4§	6/7‡	1929 ‡115	61	111‡	2	3236	
AVERAGE NO. 1	4	20					185		16		295	
" " 2	4	18	(⅙)		or ⅜	3/10	185	15¼		6½	295	
" " 3	4	18	⅙			3/10	185		16		295	
" " 4	4	18		10½			174¼		16	6½	295	
" " 5	4	18		10½				15¼		6½	295	

†Given as 5 grains granulated. A, used in column 2 for Average No. 1. *Given with the carbonate soda. ††Given as bromide ammonium. §Nearly. ‡Without the 42 A. average No. 1. Type of M. A. Seed Co.; average No. 2. Type of Ehrmann, line 8; average No. 3. Type of Blair Camera Co.; average No. 4 and 5. Type of *Photographic Times*, Line 10.

certain number of ounces of stock solutions of developer, the formulæ for one ounce of made up developer. It would simplify the compounding and modifying of developers, and would also promote a better understanding of the effect of the various constituents.

C. W. Grant.

PRACTICAL NOTES.

EVERY carbon worker—*les carbonniers*—as they are called in France, knows by experience how difficult, if not impossible, it is to wash out the chromic salt when developing on absorbing materials such as canvass, wood, etc., which always more or less retain mechanically some of it, and are, therefore, tinged yellow. They know well also that the luminous action continues in the dark after the insolation, and that the tissue becomes wholly insoluble by reduction of the potassic dichromate if kept for a certain period. These difficulties I have lately avoided by simply eliminating the soluble potassic compound through washing in water renewed until it is no longer tinted yellow, before the development. After elimination hot water may be used in developing without any danger whatever. This manner of operating is equally useful to protect the hands from the dreadful action of the chromic salt.

In using the new developer, eikonogen—and hydrochinon, also—compounded for the development of plates instantaneously exposed, the image often intensifies slowly and remains weak, unless, when the details are well out, a greater proportion of the reagent and of alkali are added. The latter tends to produce blisters and fogginess; such, at least, is my experience. I found that the necessary intensity and contrasts can be readily obtained by continuing the development, as soon as the details in the shadows are sufficiently accentuated, in a strong solution of pyrogallol containing the ordinary dose of alkali.

My last note refers to the intensification by uranium (Selle's process), now much employed both for negatives on gelatine plates and transparencies by any process. Of course one employs a dilute solution of uranyl ferricyanide made in mixing the two following solutions, in order to have the action under control:

a.	Potassic ferricyanide	5–6 grains
	Water	1 ounce
b.	Uranyl sulphate $(U_2O_2)\ SO_4$	5–6 grains
	Water	1 ounce

but it may happen, nevertheless, that the negatives print badly on account of the non-actinic color of the uranyl ferrocyanide deposited. The best method I have found to avoid much *doctoring* and manipulation is to treat the thoroughly washed negatives with a *plain* solution of gold terchloride, 1 : 150, which turns the red-brown color to a violet.

P. C. Duchochois.

FOCUSING SCALES FOR DETECTIVE CAMERAS.

Experience with three home-made detective cameras, backed up by knowledge obtained from an article by Rev. Clarence E. Woodman, Ph.D., on "Focal Adjustment in Detective Cameras which appeared in the Annual for 1888, has led me to make focusing scales to be used on detective and other cameras as follows:

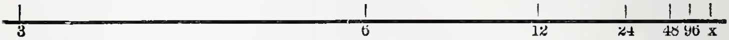
1st. Carefully focus on some very distant object, say a church steeple half a mile away, using a focusing glass, and make a mark on your focusing scale. This is the equivalent focus mark.

2nd. Carefully focus on any object (a lace curtain is good), at three feet measured distance from the camera. A mark then made on your focusing scale is of course the three foot mark.

3rd. *Midway* between these two marks (equivalent focus and three foot) place a mark. This is the six foot mark.

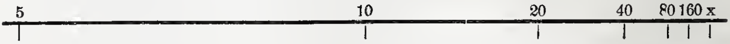
4th. Midway between the six foot and equivalent focus marks is correct for the twelve foot mark, and so on for the 24, 48, 96, etc. marks.

The above will give you a scale that looks like this:



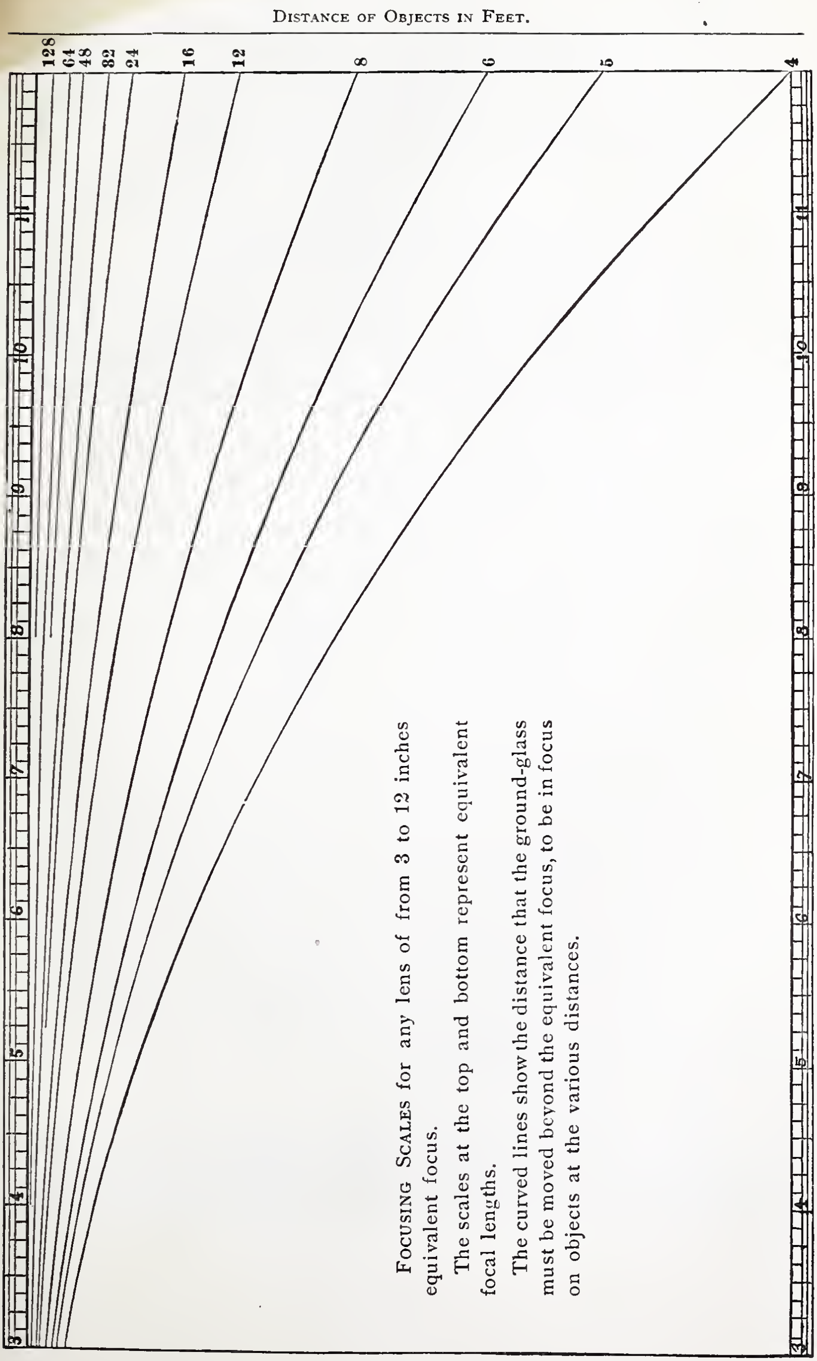
and although theoretically it is not correct, if used for lenses of short focus, say seven inches and under, it is so nearly so that the difference is unappreciable.

If you commence with a five foot mark and the equivalent focus marks, the result will be thus:



and with any mark, used in connection with the equivalent focus mark, the rule holds good that a mark placed midway represents the focus of an object twice as distant.

The above plan is worth *knowing*, as you then have it



Focusing Scales for any lens of from 3 to 12 inches equivalent focus.

The scales at the top and bottom represent equivalent focal lengths.

The curved lines show the distance that the ground-glass must be moved beyond the equivalent focus, to be in focus on objects at the various distances.

always with you ready for use as occasion requires, but if you also have with you a copy of this issue of the ANNUAL a much easier plan is to consult the diagram accompanying this article, which is correct, theoretically as well as practically, and will give you, off hand, a scale for focussing any lens of from three to twelve inch equivalent focus.

Wm. T. Wintringham.

DALLYING WITH THE DEVELOPER.

PERHAPS the developer is the innocent cause of more manipulatory war—the fell destroyer of more photographic plates than any other power accessible to the camera-lover. This is because of a general misunderstanding of what the provinces and functions of the developer are. Let me give a coarse illustration of what they are like: they are like the varied hammers used by the metal-worker. Given a sheet of metal and the proper hammer, the skilled jeweler will bring up a rounded form from the flattened surface, which will stand out in bold relief and excite your admiration. By wondrous care and dexterous handling of the tool he will create gradual depressions and gentle elevations too, which supply the delicate values in form and shape which charm you. In bringing forth his work of art his *mind* serves as the power which starts the blows—now softly—now more carefully while with greater force—until the *creation* is finished. Not once, however, did he use a sledge or apply tools which were not adapted to his work. If the average photographer would follow suit there would be less war and fewer plates destroyed. What I mean is that the *mind* is not applied sufficiently to the work of development, and that there is too much dallying with developers which are not adapted to the special work in hand or to the time of exposure given, or to the plates that have been used. Hundreds of times young workers come to me to examine their results, when, alas! I find that while tolerably good sense has been shown in the choice of subject, fair focusing, and, so far as I can see, proper exposure, everything has been killed by improper development. Then the dialogue goes on something like this:

"What developer did you use?"

"Pyro—alkaline."

"Whose formula?"

"Screeche's—with a little private modification of my——"

"But, stop! Didn't you know that the maker of the plates you used cautioned you to adhere to his formula?"

"Oh, yes; but I thought I could improve upon it."

Or, again, I am answered to the same query:

"Well, I used the hydrochinon developer partly, and I put a little pyro in to see the result."

"You *see* the result, don't you? You likewise see that for instantaneous work you have employed a developer four times too strong, and of a quality not adapted to your plates. In other words, you have experimented upon your plates—you have used a sledge-hammer where a riveting-hammer would have done. Some of your plates show great black dents and white high lights in violent contrast to each other, while the majority are flat and insipid-looking and have none of the characteristics of a blooming negative. Choose your developer after careful experiment, then stick to it and don't dally with others." *Edward L. Wilson.*

A VIGNETTING DEVICE.

The vignetter here described has been so very useful to me that I think it will surely be a help to some member of the fraternity. I am indebted to Mr. W. W. Maxwell, Toronto, Ontario, for the device. Take an empty plate-box, *a d*, Fig. 1; cut down the corners *b e* and *c d;* cut the sides half through

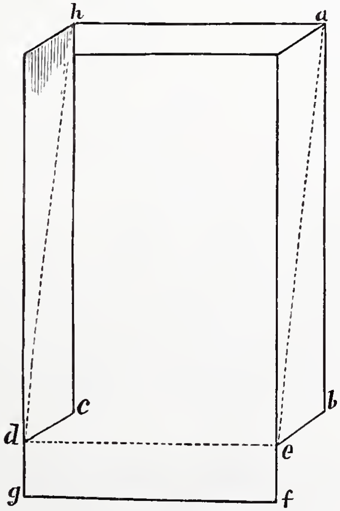


Fig. 1.

on the lines *h d* and *a e;* bend *c d h*, *a b e*, and *d e f g* half way; cut suitable opening, as at *G*, Fig. 2. Place negative in frame *A B*, and, supposing you are about to print, place thereon a piece of silver paper with the usual backing. The vignetter can then be registered without trouble and attached to the frame by the tacks at *C*, *D*, *E*, and *F*. If printed in the sun place a piece of cepa skin over opening *G*, and over all another similar vignetter with a larger opening. If the sun leaves you a moment it suffices to remove the tissue paper without destroying it. This vignetter shades the vignette off gradually at the head and around the shoulders, but more abruptly at the bottom terminating the drapery. It makes a superior vignette, is very easily adjusted, and is very economical. *T. E. Huston.*

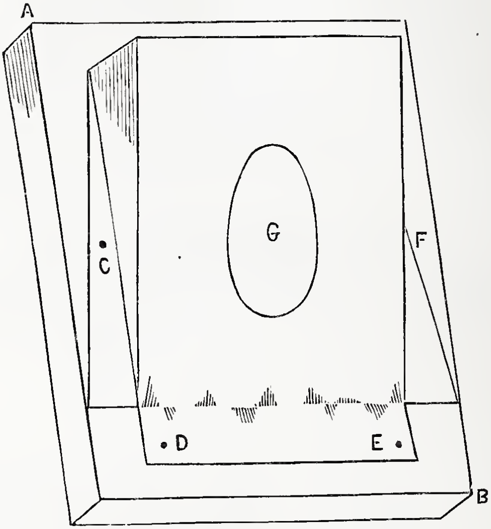


Fig. 2.

ILLUMINATING THE DARK-ROOM WITH ELECTRIC LIGHT.

When in the spring of the present year the electric incandescent light was installed into my astro-physical observatory, I took advantage of the opportunity offered, and connected the wires laid also with my photographic laboratory.

The great benefit and the comfort derived from this beautiful method of lighting a dark-room have induced me to give here a description of the arrangements made, and I am the more so impelled to do so, as electric light is used for the same purpose in many of our cities. My dark-room is provided with two incandescent lights, each of eight candle power. One of the lamps, which is suspended from the ceiling, is covered by a glass globe protected by two thicknesses of brown tissue paper. It furnishes general illumination for the room, the light being sufficiently strong to discern utensils, etc., but too feeble to endanger a sensitive plate or to produce fog.

The other lamp is enclosed in a lantern. Both of them are connected with switches in order to turn the light on or off independently of each other, or one or both at the same time. With a rheostat the light force is regulated at will.

The lantern is made of tinned sheet-iron and is of triangular form ; two of its sides are glazed, the third is solid, but has a slit. The slit can be closed, however, and as the lantern revolves upon a pivot, it can be so placed as to allow working in almost total darkness. The glazed sides of the lantern can be turned on if the sensitiveness of the plate permits me to work in brighter light.

Into one side of the lantern are inserted two ruby glasses, and between them a ground glass, while the other, similarly constructed, carries two dark-yellow, and between them an opal glass. For better security to the plate while developing, this third side is shaded by a piece of ruby fabric, into which an opening is cut six centimeters to allow examination of the plate in bright light. When the lantern is so turned that its ruby light illuminates the developing tray, the other, the yellow light, throws light upon the surroundings, shelves with chemicals, faucets, etc.

The chief advantages of electric light in the dark-room are :

1. That it neither heats nor contaminates the surrounding air. The majority of photographic dark-rooms are of small dimensions, and there seldom is opportunity of illuminating them with daylight. When gas or petroleum lights are used, the heat radiating from them will make the room very uncomfortable within a short time.

2. The light is absolutely constant and uniform.

3. Its force can be regulated at will by an adjustable resistance in the lamp circuit.

4. An electric lamp can be lighted or extinguished instantaneously, an advantage highly estimable in some experimental

work, allowing developing in total darkness, and the possibility of examining the plate by flashes of light at such intervals of time as may be desirable.

When of greater force, say of thirty-two candle power, the electric light may be advantageously employed for printing upon bromide of silver paper. The proper distance of the negative from the sources of light once determined by previous experiment, and the constancy of the light will secure at once the correct time of exposure without being compelled to make repeated experiments.

The electric light has been productive of greater comfort than ever before enjoyed in a dark-room, and its utility has not yet been tested in every direction, nevertheless I can recommend its introduction wherever feasible.

Eugen von Gotthard.

GILDER'S HYDROCHINON DEVELOPER.

The many attributes of pyrogallic acid that cause trouble in developing dry-plates, such as staining the film, frilling, and the many discomforts so familiar, can be well avoided by the use of Gilder's solutions, which act very slowly, giving time to judge how to treat the plate if it gives evidence of over or under exposure, especially in very rapid exposures, the absence of staining where long soaking or forcing is needed, and rendering the picture with much the appearance of dry-plate negatives. Besides all these good qualities, the stock solutions, even after use, can be kept almost indefinitely, and are therefore economical and convenient. The formula of Gilder's hydrochinon developer is as follows:

No. 1.

Sulphite of soda crystals	480 grains
Phosphate of soda crystals	160 grains
Hydrochinon	100 grains
Water	8 ounces

No. 2.

Carbonate of soda crystals	480 grains
Phosphate of soda crystals	160 grains
Water	8 ounces

For use take one and one-half ounces each of No. 1 and No. 2, and one and one-half ounces of water. With very rapid short timed exposures use the freshly mixed developer, but for all time exposures, begin the development with solution that has been used several times, or else add a few drops of bromide potash ten per cent solution. In using the mixed solution without extra bromide, have a stock bottle for old bath, and make it a rule to keep that which is normal for beginning development of time or over-exposed plates. After a certain amount of experience, modifications can be made of the amounts of stock solution most beneficial, and even in the hottest weather there is but little tendency to frilling.

Experience with this developer warrants a trial of it, although plates comes up very slowly, sometimes four or five minutes elapsing before the high-lights begin to show, and soaking for twenty minutes, or even more, before sufficient density is acquired. This tardiness, however, is compensated for by the complete control afforded and the facility for adapting modifications of the bath.

After the development is completed wash the negative for five minutes, immerse in hypo till well fixed, washed, soaked for five minutes in clean alum solution, washed thoroughly, and dried, as is customary with pyro development.

What effect the phosphate of soda has in the chemical action is difficult to determine. It no doubt is a retarder, but possibly a preservative for the hydrochinon, and old developer can be used repeatedly, and has been utilized for six months, owing to the loss of portions in each trial. Where over-exposure on rapid plates is assured it is well to take, say, 75 of new to 25 of old, with time exposures which are overdone, 50 of new to 50 of old, and so with under-exposed plates, more or less soda solution, or water, or new developer can be taken. Should the old developer become cloudy, filtration will be very useful, and avoid spots. For slide making, full exposure and old developer give very satisfying positives on the various makes of such plates.

It is well to use clean, fresh hypo and alum solutions, and not use them after they have assumed a canary yellow color. Plates with this method can be very readily washed in running water in an hour or two, and can be strengthened with corrosive sublimate and ammonia or reduced, with a very good assurance of safety.

To the busy worker the length of time of development is an annoyance, but by using five or six pans, and having a careful oversight, as quick time can be made as with pyro, and a very much increased ability to know how to modify the development. Many a plate that is lost in pyro can be made into a good negative with this formula, and I therefore recommend it after an experience of eighteen months almost continuous use, winter, spring, summer and autumn. *Frank H. Rosengarten.*

SILVER PRINTING.

It is to be regretted that all branches of photography have not kept abreast in the march of progress.

While the processes for making negatives have advanced wonderfully in the last few years, those for making the finished pictures are almost where they were twenty years ago. Of course, advance has been made in printing, but the most improved processes are far behind the rapid dry plate, and most of these late-day methods of printing have the same general objection; the necessity of having daylight, and plenty of it, to work them. Those which can be worked by artificial light, are of but little use to the professional photographer, except for enlarging. It will be a red-letter day in photography when some one discovers how to make by artificial light, prints which resemble in tone, and finish, the present albumen prints; something which we will not be obliged to educate the public to, but which they will take without knowing that they are getting anything different from what was always given them. Until such a process is discovered, however, thousands of us will have to struggle with the weather and the silver bath, and it is with the hope of making a part of that struggle a little easier that I recommend the bath which has given me the least trouble, and proved the most reliable, together with the manner of my using it.

Several years ago, Mr. Henry J. Newton advised the use of a silver bath containing a considerable proportion of nitrate of ammonia, and rendered alkaline by the addition of liquid ammonia. A trial convinced me that it had many advantages over the ordinary silvering solution.

Experience has led me to change the Newton formula a little, but years of varied usage, under all kinds of conditions, and in several climates, makes me feel to-day that in this bath I have a true and reliable friend.

It is made as follows:

Nitrate of silver	50 grains
Nitrate of ammonia	30 grains
Water	1 ounce
Then add liquid ammonia	3 minims

After all is thoroughly dissolved and mixed it should be tested with the hydrometer, and a record made of its register. It is then ready for use. Any good standard brand of albumen paper works well with it, and any toning bath that will work with the particular brand of paper you are using, when it is silvered on an ordinary bath, will work just as well when this bath is used.

Don't fume, as this is only a waste of time. If enough liquid ammonia is added from time to time to keep the bath slighly alkaline, and the paper is dry when being used, it will print blue, and act just the same as fumed paper. Add silver after each using to keep it up to the usual register, but never add nitrate of ammonia unless you are adding more bath to increase the quantity. This will be necessary, every now and then, as the paper absorbs the liquid, when it is necessary to do this, a measured quantity of water should be added to the bath, then for each ounce of water added, put in 50 grains of nitrate of silver, 30 grains of nitrate of ammonia, and 3 minims of liquid ammonia. Test with the hydrometer, and if it falls below the original register, add silver until it shows the same. Never put anything else in it, and never sun it. If it discolors, you have neglected to keep the proper quantity of silver in it, put in more, and it will clear itself over night.

If it does not tone clear, your silver is too low. If the prints show measles, you have neglected to keep it alkaline, add ammonia until red litmus turns slightly, but surely, blue.

That is all the trouble you will ever have with it; you may use it every day, year in and year out, or you may set it aside for months, it is always the same, and like a faithful dog is always ready to answer to your call. *Harry Platt.*

NOTES ON ORTHOCHROMATIC PHOTOGRAPHY.

Commercial orthochromatic plates, when exposed through suitable color screens, give correct color values for all colors except reds and red-browns, but it is a mistake to suppose that they will give anything like correct results without the color-screen. Ordinary plates exposed through a yellow screen that cuts off all of the violet and ultra-violet, and nearly all the blue rays, give distinctly better results than commercial orthochromatic plates used without any color-screen.

There is reason to believe that nine out of ten photographers who have tried the commercial orthochromatic plates have failed to realize their capabilities, because they exposed them through unsuitable color screens. I have seen bright orange-yellow screens that appeared perfect to the eye, but which transmitted so much ultra-violet light as to make them practically worthless. Screens for use with the commercial orthochromatic plates of this country should always cut off all of the ultra-violet, $\frac{99}{100}$ of the violet, $\frac{9}{10}$ of the blue, and $\frac{1}{2}$ or $\frac{3}{4}$ of the dark green rays of the spectrum. If they are to be used in the reproduction of oil paintings and similar subjects they should cut off nearly all of the dark green and some of the yellow-green rays besides.

The production of suitable color screens does not seem difficult, and I have made hundreds of them, of various shades and colors, for special purposes. I flow select crystal plate glass with plain collodion, and then, when it is set, with an alcoholic solution of a suitable dye, or mixture of dyes. When dry, I mount with Canada balsam against another plate-glass, and bind with paper. Screens of colored glass, with true surfaces, have been placed upon the European market, and are far better than an inexperienced person would be apt to make by my method, but the color is not just what it should be in those I have seen.

No commercial plates are sufficiently red-sensitive to give correct color-values for all colors, even with deep orange screens. Only collodion bromide plates, treated with chlorophyl according to my method, or gelatine bromide plates suitably treated with cyanine (alone) are capable of giving such results, and both kinds should be used immediatly after preparation. There are subjects for which such plates must be used, but the processes are too troublesome for use where the commercial plates will answer the purpose, and no method of sensitizing ordinary plates with cyanine can be relied upon unless the plates are fresh from the factory. Seed plates (and possibly some others), *fresh from the factory*, when treated with cyanine, either by Schumann's bath method or by my method of flowing, then coated with gelatine or albumen to protect from atmospheric influences, and dried in a tight box with chloride of calcium, will keep good for a week or two, but I prefer, when possible, to prepare one at a time as required for use. *F. E. Ives.*

"OFF DUTY."

The instantaniety of this remarkably fine picture is, to say the least, far above criticism.

Lieutenant Carl von Hiller of the Imperial Austrian Artillery is its author, and it was selected from a large collection of equally perfect plates.

The reproduction from which the print has been made comes from Mr. William Kurtz's extensive establishment, so favorably known for its great superiority in making half

Photographed by
Lieut. Carl Von Hiller.

OFF DUTY.

William Kurtz, N. Y.

tone high relief clichés, according to the Meisenbach precepts, and printable upon the ordinary type press. The work done is that of an adept in this particular branch of the graphic arts.

The collection from which the original has been selected was presented to us by Charles Scolik, Esq., of Vienna.

EXPERIENCE WITH BROMIDE PAPER.

To those who have but little leisure time by daylight to make prints, and those who find some difficulty in getting pleasing tones on albumen paper, or who wish to make enlargements from small negatives, I would recommend bromide paper, and I think they will be pleased with the beautiful results easily obtained. I have tried paper from six different manufacturers, French, English, and American, and although as good pictures can be made on one as well as another, when you have mastered the method, yet I am of the opinion that, to the amateur who only makes occasional prints, Eastman's permanent bromide paper will be found the most suitable. For contact printing I use an ordinary coal oil lamp placed at a fixed distance from the printing-frame, and then for time of exposure have only to estimate the printing quality of the negative. A good negative is necessary, in order to make good prints on any paper, but I think a better print can be made from a poor or weak negative on bromide paper than on any other. As a rule, I think rather long exposures and weak developer is preferable to short exposure and strong developer. Dense, hard negatives should have a developer weak in iron. The thinner and softer the negative, the more iron I use in proportion to the oxalate of potash; in extreme cases even as much as one to three.

Rapid development is apt to give a weak, flat image, while too slow a development produces violent contrasts. Prints can be toned from a warm brown to a red with nitrate of uranium and *red prussiate* of potash, but I have found some prints thus toned, and exposed to strong sunlight continuously during the past summer, have faded considerably, while prints not toned have retained their brilliancy. I find that I can use the same developer and hypo for two or three batches of prints without any appreciable difference in the result, by filtering carefully after using. I find also that if *thoroughly fixed* a good deal less washing is necessary than is usually demanded. The prints are developed with ferrous oxalate, made acid, then washed in acidulated water, which seems to me a good reason for being sure that the fixing bath is alkaline. I am very sparing of bromide and do not believe that it is at all times either necessary or beneficial. When my prints are thoroughly dry I straighten them by ironing on the back with a moderately hot iron. There are various methods of preserving the iron solution; perhaps as good and simple a way as any is to fill a bottle half full of the *bright green* crystals, fill up to the cork with water and cork tightly; each time any of the solution is used fill up again with water, as long as there are crystals to dissolve. Neutral oxalate of potash is easily and cheaply made as follows: Carbonate of potash, forty ounces; water twenty ounces; stir for a few minutes and allow it to settle. In another vessel oxalic acid, nine ounces; boiling water, twenty ounces; stir until all the crystals are dissolved. Pour slowly the potash solution into the acid solution with constant stirring until neutralized, which is determined by the effervescence ceasing. Test with litmus paper; the solution should prove neutral or slightly alkaline. Drop in carefully, a few drops at a time, sufficient sulphuric acid to turn blue litmus paper red. Allow it to cool and pour off the clear solution; you have then a saturated solution of oxalate of potash. A much larger vessel must be used for the oxalic acid than is necessary for the bulk of the solution, as a violent ebullition takes place while the two solutions are being mixed. *W. Imlah.*

CLEANING GLASS PREPARATORY TO COATING.

The preparation of a plain, unwashed collodion emulsion, is a simple matter, requiring scarcely more skill than is necessary to weigh and measure the ingredients properly.

The real difficulties to the beginner in working the process will likely be found in the preparation and coating of the plates, so as to insure good and uniform results.

The following is the plan I have followed in cleaning and albumenizing glass previous to coating with emulsion. It has proved very satisfactory in my hands, although there is little in the method that will not be familiar to those who have worked the old fashioned wet plate process.

Immerse all plates, whether new or previously coated with gelatine or collodion emulsion, in a solution of

Bichromate of potash	4 ounces
Sulphuric acid	5 fluid ounces
Water	3 pints

This will be recognized by some as the ordinary "bichromate battery solution," and is kept on sale by most of the drug stores.

This solution requires a little care in mixing, as the addition of sulphuric acid to water is accompanied by a considerable rise in temperature; pour the acid slowly into the water, stirring all the time; when cool, add the bichromate and stir occasionally until it is dissolved.

The plates are allowed to remain in this solution for 24 hours, or until wanted for further use; they should be occasionally moved to allow the liquid to get between them; care should be taken, however, to avoid getting any of the solution on the fingers or clothing, as it is very corrosive.

When the plates are wanted, pour off the acid solution, which can be used over and over again, rinse off the plates well under the tap and scrub thoroughly with a "Bailey" rubber brush, to remove every trace of the former coating, if any. In the case of plates that have been coated with gelatine emulsion, if there is much of the coating left, it may be well to pass them back into the acid a second time, but this is not often necessary if the solution has had free access to them during the first treatment.

After scrubbing and washing thoroughly, let them rest in a draining rack until dry, or nearly so, wher they are ready for the next operation.

Take each plate on a pneumatic holder and rub the surface to be coated with a solution of

Caustic potash	80 grains
Water	2 ounces
Alcohol	2 ounces

This is best applied as follows:—Into the mouth of a clean one ounce wide mouth vial introduce enough absorbent cotton to form a sort of a brush, of which the bottle is the handle, protecting the fingers from the alkaline solution, while the cotton is dipped into the solution and applied to the plate, which should be rubbed well with it and then washed under the tap to remove every trace of the alkali. A solution of albumen is now flowed over the surface of the plate, while it is still wet. I generally flow each plate twice; the first application displaces the water which remains on the glass after washing, and is thrown away; the second is poured into a paper filter and after passing through this is used over again. Care should be taken that the albumen solution reaches every edge and corner of the plate.

The plates as albumenized are put in a drying rack and placed in a situation free from dust, until perfectly dry, when they are ready to be coated with the emulsion.

In racking them up to dry, the albumenized surfaces should all face in one direction, as otherwise it is impossible to distinguish them; the same order should be observed if stored away for use.

The albumen solution is made as follows

White of one egg.	
Water	20 ounces
Alcohol	1 ounce
Precipitated phosphate of lime	120 grains

Mix in the order named, shake until the albumen is dissolved and filter through good white filtering paper. The use of the phosphate of lime is merely mechanical, to assist in the filtration; which is otherwise tedious or almost impossible.

The pneumatic holder which I use was improvised out of a "Home" breast pump, made by Whitall, Tatum & Co., Philadelphia, Pa., which consists of a rubber bulb, having an extension of the same material, of the proper shape for the original use intended, and a side branch to which is attached a small glass bottle; the bottle is removed and the side opening securely and permanently closed; then, by compressing the bulb and applying the mouth of the instrument to the back of the plate, it takes a firm grip and is as easily removed. There may be a regular pneumatic holder made on this plan, but if so I have no knowledge of it.

After testing different methods of cleaning glass, especially old plates, I give preference to the above, and it is really more simple than would appear at first glance.

Thos. Kennedy.

SOME EXPERIENCES IN PHOTO-MICROGRAPHY.

More than a dozen years have now elapsed since I made my first photo-micrograph; at that time the successful workers in this country could be counted on one's fingers, and the old mussy wet process and expensive appliances were regarded as indispensable for good results. The development of amateur photography following the general introduction of dry-plates could not fail to influence photo-micrography, since few microscopists viewed with indifference the placing at their doors of a ready means of recording observations. The experience gained during ten years of continuous work, covering almost every class of subjects, with amplifications ranging from four to four thousand diameters, has, naturally, emphasized many facts; the possibility that a brief statement of these conclusions may aid younger workers in this field, must be my apology for the egotism of these remarks.

While appreciating fully and endorsing heartily the efforts of those working with no greater responsibility than their individual enjoyment, it is rather to those seriously engaged in endeavoring to produce the best and highest class of this work, that these suggestions are offered.

The three essential conditions for success in photo-micrography are:

1. Satisfactory apparatus;
2. Good illumination;
3. Suitable preparations.

Satisfactory apparatus by no means implies elegant appliances, but adaptation to purpose, so that the microscope be very solid and firm, and supplied with a substage to which a condenser can be attached and satisfactorily adjusted, and that the camera be of sufficient length, it matters little as to exact form or detail; for high powers, the mechanical stage is a convenience, and for extreme amplifications (2000 and over), well-nigh a necessity. The most complete photo-micrographical outfit to be had is, undoubtedly, the one made by Zeiss, of Jena, but since the same, without microscopical objectives, costs over $500 to import, there are few willing to invest such a sum for its acquisition. Of greater importance, however, is the quality of the objectives, for only those of the most perfect corrections will stand the severe test of photography. While there are many others, which personal use has shown to answer well, my experience would lead me to select the following as being especially satisfactory: 3 inch Crouch, 1½ inch Beck, ¾ inch Bausch & Lomb, $\frac{4}{10}$ inch (BB) Zeiss, ¼ inch "Photographical" Bausch & Lomb, ⅙ inch (DD) Zeiss, $\frac{1}{12}$ inch oil immersion apochromatic Zeiss. The 3 inch Crouch and the $\frac{4}{10}$ inch (BB) Zeiss deserve especial mention, as for crisp definition over an entire perfectly flat field they are unsurpassed; for high amplifications, the new apochromatic oil $\frac{1}{12}$ Zeiss is superb.

The question, whether to receive the image directly from the objective on the plate, or to employ some means to project the image, has received of late much attention. While fully appreciating the theoretical objections to the direct image, I confess, that for low and medium powers, I continue to use it by preference, as the photographs so obtained fully equal in every respect any, which I have ever seen, made by the indirect mode. With high amplifications (1000 diam. and over), the conditions are greatly changed by the approach to the limit both of the shortness of the focus of the objective, and of the length of camera, which can be advantageously used; my experience leads me to adopt the $\frac{1}{12}$ inch objective as the one, and not over four feet as the other limit, since any given high amplification, say 2000 diam., can be more satisfactorily and more conveniently obtained with a superior $\frac{1}{12}$ in connection with suitable optical means to increase the initial magnifying power of the objective, than with an unaided $\frac{1}{25}$ lens and the plate removed to a great distance. Until quite recently, the various amplifiers offered the best means of increasing the power of an objective, but the introduction of the "projection-oculars" of Zeiss has given us an accessory for this purpose far superior to the older devices. These projection-oculars resemble the ordinary microscopical-oculars, or eye-pieces, only in general form and in name, being optically a projection objective, in connection with a collecting lens. The new oil immersion apochromatic lenses, in combination with these projection-oculars, form, undoubtedly, the most efficient equipment for high power work, and have but one drawback—their cost. It is, unfortunately, as true for high power photography as for microscopical observation in general, that the best results are to be obtained only with fine, and necessarily expensive, optical appliances. If for the satisfactory study of the intimate structure of a cell, or of a micro-organism, the most improved immersion lenses are necessary, it is to be expected, that for the successful photographing of the same, tools, at least as good, are needed. The complicated mechanical arrangement for controlling the focusing adjustments from a distance, may usually be replaced with advantage by the simple contrivance of cords and weights, devised by the writer more than a dozen years ago, which has been so generally adopted in this country; during the extended continued use of this little device, it has never been found wanting, responding perfectly to the severe demands of the highest amplifications. A modification for the coarse adjustment, having pulleys and very heavy weights, serves equally well when very low (2 to 5 inch) lenses are used. A very stiff spring in the fine adjustment may sometimes require increased friction to prevent the cord from slipping, the necessary traction being obtained by heavier weights, or by taking an extra turn of the cord about the milled-head of the micrometer screw.

My conclusions regarding the second of the necessary conditions—good illumination—are briefly stated; after many experiments with various kinds of artificial illumination, and after the examination of innumerable specimens of the best work of acknowledged experts, while, of course, admitting that good photographs can be made, under suitable conditions, by these means, yet I am fully pursuaded, that sun-light is by all odds the best, and, for high powers, the only really satisfactory illumination by which to make photo-micrographs that are satisfactory as photographs, as well as records of microscopical observations. That even by good lamplight fair impressions of objects under extreme magnification can be obtained, no one questions, but the negatives produced by such illumination seldom, if ever, possess the characteristics of a really good sunlight negative, where the sharpest details are combined with an exquisite softness and harmony of half-tones. That a photo-micrograph should be a silhouette of deep shadows and chalky whites, is a proposition to which I could never subscribe. Sharpness and vigor are, of course, the first essentials in a photo-micrograph, but there seems to be no reason that in such a picture all the qualities of a good photograph should not be represented. An almost identical opinion regarding the advantages of sunlight, has been reached by Dr. R. Zeiss,* after a most exhaustive series of experiments with artificial illuminations of all kinds, stimulated by the hope of finding a satisfactory substitute for sunlight, the uncertainty of which, during the greater part of the year, is even a greater inconvenience in Germany than with us.

The third condition for good work—suitable preparations—though last, is by no means least, for all apparatus and illumination avail but little, when proper preparations are wanting. Thanks to our present microscopical technique, these are readily obtained, since extremely thin and well-stained preparations of vegetal and animal tissues are now matters of everyday production. The thinness with which sections are now usually cut (.005—.01 mm.) often renders them, when stained with the staple carmine dyes, too actinically transparent to photograph well with very low powers. The interposition of some ray-filter readily overcomes this; during the last three years a screen of yellowish-green glass has been in constant use, with the most satisfactory results, yielding plucky pictures of objects entirely too transparent to produce sufficient contrasts in the negatives; the exposure, however, is increased about three to five times, but this, even when thus lengthened, seldom exceeds 20–25 seconds, on Carbutt's "B 12" plates. Where great differences of color are present in the same preparation, or where certain unfavorable tints, as deep brown, prevail, the orthochromatic plates offer decided advantages; for, however, ordinary preparations with but one stain, the color-screens, when judiciously selected, will yield equally good pictures, with a gain in economy, convenience, and certainity. The modified hæmatoxylin stains, producing browns and slate-blues, are very valuable for special purposes, but require some considerable technical experience for their successful production.

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* Special Catalog über Apparata für Mikrophotographie. Jena, 1888.

What has been written may appear to discourage the undertaking of this most fascinating branch of photography, where the primary object of instructive entertainment does not warrant the acquisition of the class of appliances above recommended; this should not be so, as the full force of these suggestions applies only to those whose work in this line necessitates the use of the higher amplifications, with the view of producing the highest possible results.

To the amateur, who has been using but lamplight for his exposures, it is suggested that he avail himself of some bright "off-day" to give sunlight a trial. If the mirror of the microscope be of good size, it will be only necessary to make an arm on which to support the removed mirror outside some southerly exposed window, since it is desirable to have much more distance between the mirror and the stage, than would be possible were the mirror attached in its usual place. Where the microscope mirror is too small to be satisfactorily used, a rectangular wood-framed looking-glass is readily mounted with the aid of a few strips of wood, so as to turn about both axes.

The rays from the plane side of the mirror are passed through a condensing lens (of 8-10 inches focus, if possible), so placed, that they are brought to a focus before reaching the plane of the object. The exact position of the condensing lens is a matter of experience; usually, however, the most favorable illumination is obtained at that point where the field is still *uniformly* illuminated, just before the rays form an image of the source of light; the nearer the rays are focused, the less disturbance from diffraction rings. Ordinary objectives will require the employment of monochromatic light—produced either by a deep blue solution of ammonio-sulphate of copper, or by the green glass screen already mentioned—

since the optical and actinic foci do not usually coincide. Powers up to the three-quarter inch will require no further condenser; with the one-quarter or one-sixth objectives, the low power (one or three-quarters inch) serves with advantage as an achromatic condenser, when attached to the substage. The Abbe condenser, although so important for refined microscopical investigation, is not adapted to photography unless a very wide cone of light is desired, which, for the majority of preparations, is a decided disadvantage; a low power objective, used as a condenser, will generally be found more satisfactory, than the Abbe with a small diaphragm.

The simple apparatus indicated, when properly handled, will produce excellent work with such powers as the amateur is likely to employ; focusing the image by the monochromatic light, and avoiding over-exposure, being the points especially requiring experience. When it is remembered, that seconds, with very slow plates, usually suffice, for the minutes with rapid ones of an exposure by lamplight, the intensity of the actinic power of the sunlight will be somewhat appreciated. Some simple arrangement, by which the rays from the mirror may be cut off with sufficient rapidity, will suggest itself; an effective one is a small shutter, turning at one end on a screw and covering a circular opening in a board, through which the rays from the mirror pass; the rapidity with which the sun's image from a fixed mirror becomes decentered necessitates a readjustment of the light just before each exposure, but the patience thus exercised will be more than repaid in the character of the resulting negatives.

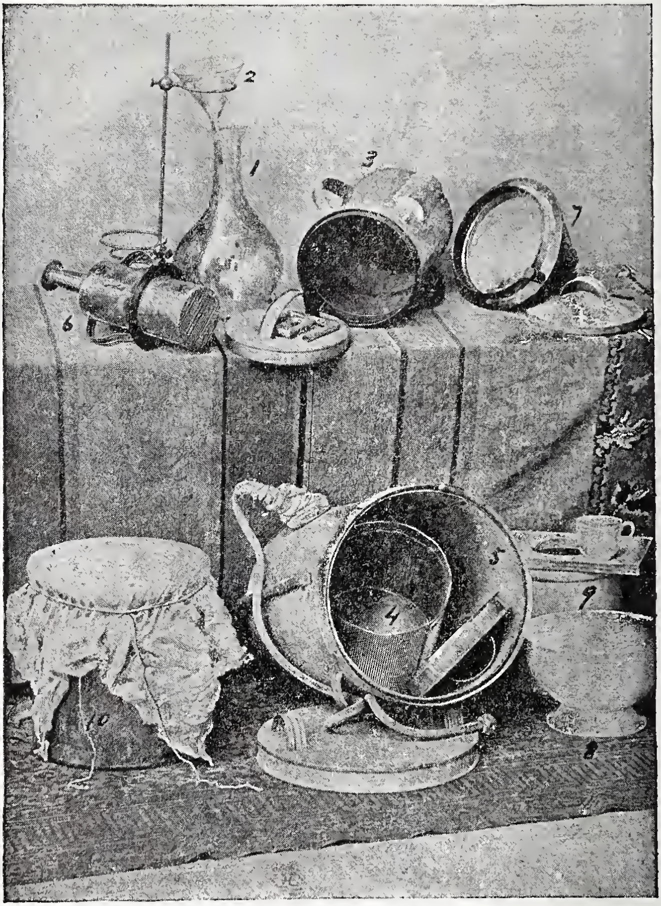
George A. Piersol, M. D.

EMULSION MAKING.

The preparation of the glass is of as much importance as anything else, as the keeping quality of the plates and the evenness of coating depend very much upon it.

I place the glass in large stoneware jars, with enough of a mixture of commercial nitric acid and water in equal parts to cover it—let it soak for several hours, wash well, and flow, on the concave side, with solution of silicate of soda in water—crystallized silicate of soda, an ounce or two, in a half-gallon bottle filled up with warm distilled water, well shaken and filtered. This stock bottle can be filled up repeatedly, as the silicate is very sparingly soluble in water.

Allow what was first flowed over the plate to run off, then



Description of Apparatus.

No. 1. Open mouth, one gallon boiling flask.
2. Funnel, with notched cork, for adding silver.
3. Cooker, 15 in. high × 9 in. diameter, made of copper. Thermometer as shown, and pipe arranged for escape of steam.
4. Inside perforated can for washer, 10 in. high × 9 in. diameter, made of white metal, and nickel-plated.
5. Washer, 16 in. high × 15 in. diameter, made of galvanized iron.
6. Shredder, made of copper and plated with silver.
7. Double copper funnel, to be filled with hot water, and glass funnel placed inside for filtering.

(*Continued on page* 206).

flow a second time and place plates in clean racks to dry. This should be done in a room free from dust.

After drying, tie up in packages and store away ready for coating.

Formulæ for Emulsion. (One Gallon.)

No. 1.—	Water distilled	36 ounces
	Atwood's alcohol	4 ounces
	Glacial acetic acid, enough to slightly redden litmus paper.	
	Bromide potass.	(3 oz. 6 drs.=1800 grains
	Iodide potass.	80 grains
	Heinrich's soft gelatine	480 grains

Place all of above in a one-gallon large mouth boiling flask, and place flask in cooker (see cut), and raise to 160 degrees Fahrenheit.

No. 2.—	Water, distilled	36 ounces
	Atwood's alcohol	4 ounces
	Nit. silver cryst	(5 oz.)=2400 grains

Place all of No. 2 in another flask and heat to 160 degrees Fahrenheit.

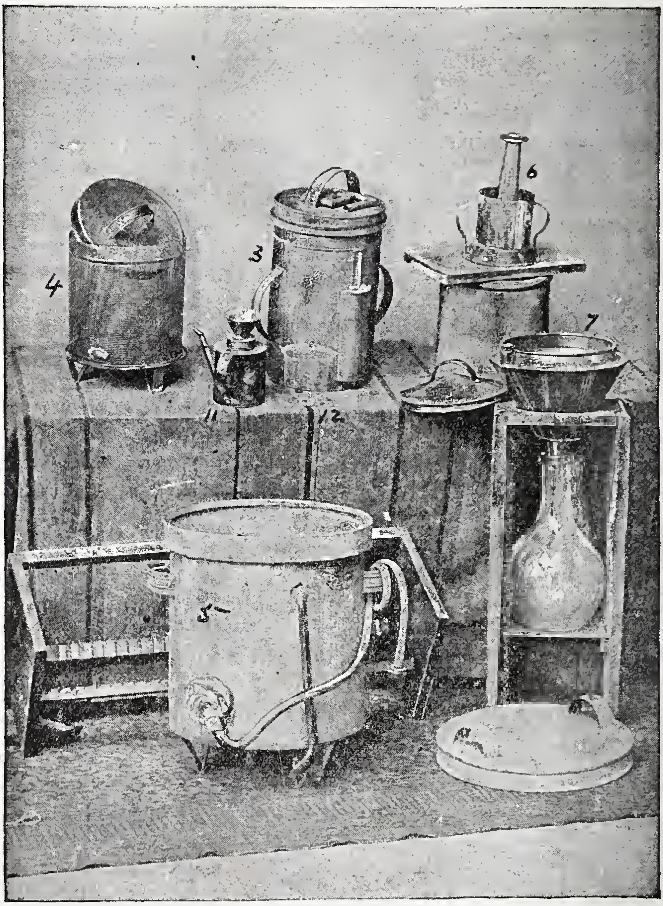
Now, both No. 1 and No. 2 being at 160 degrees, add silver solution in fine stream to bromized gelatine (in dark room).

Use a glass funnel, with a small notched cork in small end, so as to allow silver to flow in a fine stream. The funnel can be supported in a retort stand, or by a bracket, so that the flask containing bromized gelatine can be thoroughly shaken while the silver is being added.

When all is mixed, place the large flask containing the emulsion in the cooker, the water in which has, in the meantime, been heated to 190 degrees Fahr., and stew for one hour, keeping heat up to 190 degrees. The cooker should be taken into the dark room at the end of each quarter hour, the flask taken out, and well shaken, during the time of stewing.

Then pour out into a gallon bowl (in dark room) and allow emulsion to cool to 80 degs. Fahr., when the second gelatine is to be added.

The second addition of gelatine, consisting of Simeons' Hard Swiss Gelatine, two ounces, Heinrich's Soft Gelatine, four ounces, is to be placed in a large bowl of cold water and allowed to soak during the cooking of the emulsion, then, while the emulsion is cooling, the cold water is to be poured off, the bowl containing the soaked gelatine placed in a water bath, and the gelatine dissolved with *as little heat* as will accomplish the purpose. The emulsion, which has now cooled to about 80 degs. Fahr., is to be poured (in the dark room)



Description of Apparatus.

(Continued from page 204).

No. 8. Large bowl, for soaking and dissolving second gelatine, and for mixing emulsion, and in which it is allowed to set.

9. Jar and board with hole, through which is placed the shredder, for forcing the shredded emulsion into water in jar.

10. Jar, with coarse muslin tied over top, to place washed emulsion in, to drain.

11. Pouring can, copper, silver-plated inside and out. Pours from bottom, and excess poured back into funnel on top.

12. Glass beaker, for heating distilled water to add to finished emulsion, to bring up to necessary bulk.

into the bowl containing the dissolved gelatine, and *very* thoroughly stirred, with a strip of glass, until well mixed. Then place bowl of emulsion in a pan of ice water to set. After emulsion is set firmly, take a tea-cup, and cut out in chunks and place in shredder (see cut); place shredder over a jar half full of cold water, and, by forcing the plunger down, the emulsion will fall into the water in shreds. Now take the washer (see cut) into dark room, remove top and pour the water and shredded emulsion into the perforated inside can of washer, replace the top and connect the washer with hydrant and wash for four or five hours.

While emulsion is washing, place a large jar in dark room, with some coarse muslin or cheese-cloth tied over the top, so as to sink down in the middle, into which pour the mass of shredded and washed emulsion and allow it to drain for an hour.

After draining, place it (with clean hands), in large mouth flask place flask in large can of water and dissolve at about 120 degs. Fahr. The emulsion is now ready for filtering. Use filtering cotton, fill the cotton full and loose with hot water and put into neck of funnel, not too tight, and if emulsion passes through too fast, press down the cotton with glass rod until it passes in a *fine* stream or very rapid drops.

The filtering should be done in a hot room, and if the emulsion does not measure 128 ounces, add distilled water to bring it to that amount. After filtering, add four ounces Atwood's alcohol.

After filtering, keep for *three* days to ripen—when you are ready to coat.

My practice has been to do all my plate-making in the winter, after the holidays, and if above directions are followed, and plates are *coated* in a warm room and *set* quickly in a cold room, placed in racks, and, after coating is finished, placed in the warm room to dry, the resulting plates will be clean, clear, and brilliant, and will *keep*. Each gallon should coat about 300 6½x8½ plates.

Successful plate-making is more the result of attention to details than from any particular formulæ, I think. I am indebted to quite a number of writers on plate-making, and particularly to Mr. Chas. E. Smith, for what little I have tried to explain to my fellow photographers in this article.

In my earlier attempts at plate-making, I followed exactly the various formulæ given in the journals, etc., and also tried various modifications, in *all* of which the quantities given were small, and I found it much more difficult to make up *small* lots with *uniformity* than to make a quantity as large as will be produced by following the foregoing directions, which, by the way, should make one gallon of finished emulsion.

Fred. S. Crowell.

PERPLEXITIES AND SUCCESS IN TONING.

In the very beginning of my disease—"*Fièvre Photographique*," I discovered many startling things, symptoms and causes, which were apparently unwritten facts, that the literature of photography had ignored, hence I was groping for a long time in Cimmerian darkness, and bumping into all sorts of obstacles. But, being of the "hold on" kind I poked and nosed around everywhere, till I found a *cause* for most *effects.* The very worst trouble, and I fear it is the same with fifty per cent. of all amateurs at first, was in printing and toning. I made numbers of fine printing negatives, but to turn out faded, over-printed, measly, horrid prints seemed to be an every day result. The paper, the toning and fixing bath, in turn received a blessing. I tried every formula I could find, fumed (in more ways than one), wasted quarts of fluid and dollars of gold, but with only an intermittent success; then gave up in despair, and took to bromide and platinum for a time, was flatteringly successful with these, but though I considered the effects more artistic, I was not going to be conquered by the "Argentine Confederation." One day in reading a German technical journal (I have forgotten the name) I saw in the queries a plea from one evidently in the same boat as myself, and the answer struck me as founded on "Barn-yard" sense; well, I tried it, and lo! there was no more work for the recording angel as far as I was concerned. The formula given just suited me, for I was *born tired*, and the fact of toning and fixing at one and the same time was exquisite delight. Well, after uniform success in getting good tones, I was led to the conclusion that the *raison d'ètre*, was, that never under any circumstances should the bath be allowed to get acid, but always kept slightly alkaline.

The following bath which I use, is not new, but quite a chestnut to many; however, as there are hundreds of amateur recruits added to the ranks daily, it may be new to them.

The formula is:

Gold chloride	18 grains
Tungstate of sodium	3 drachms
Hyposulphite of soda	6 ounces
Sulpho-cyanide of ammonium	5 drachms
Water (melted ice)	24 ounces

The first requisite in mixing the above, I find to be pure chemicals, and very thoroughly dissolving them before adding the gold chloride. My procedure is to first carefully weigh out the tungstate, hypo and sulpho-cyanide, which I dissolve in about 20 ounces of water; then dissolve the gold chloride in the remaining four ounces of water, which I add when the sodium and cyanide crystals are all dissolved and *not before.*

The quantity of gold may appear rather large, but I tone not less than a dozen sheets at a time, as I do not tone every day, but wait till a large quantity of prints are on hand, then finish up the lot at once. Also, I think any stinting of gold is a grave error.

Have your *exclusive* toning dish filled with the bath, and throw in it a piece of *red* litmus paper. If the bath is all "O K," the paper (litmus) should show a slightly blue tinge, if it does not (and it frequently gets mulish and won't), then add, drop by drop, ammonia till the litmus turns blue. Put in your prints without any previous washing, and prepare to be surprised, for they will soon have a jaundiced look, sort of "yallery," Grosvenor gallery look, but *that's all right*; so don't worry, but rather worry if they do not turn yellow, which would be sad. The yellow indicates that the bath is working right. Plenty of movement of the prints is desirable till they are toned the right tint; when this desideratum is attained remove them to a little water with a trace of salt, only a trace, as then blisters will be avoided; remove after a minute and wash thoroughly. I wash them about two hours in running water. Once only did I have yellow whites, that I hear so many complaints about, and that time on testing my bath I found it acid; a few drops of ammonia cured the disease.

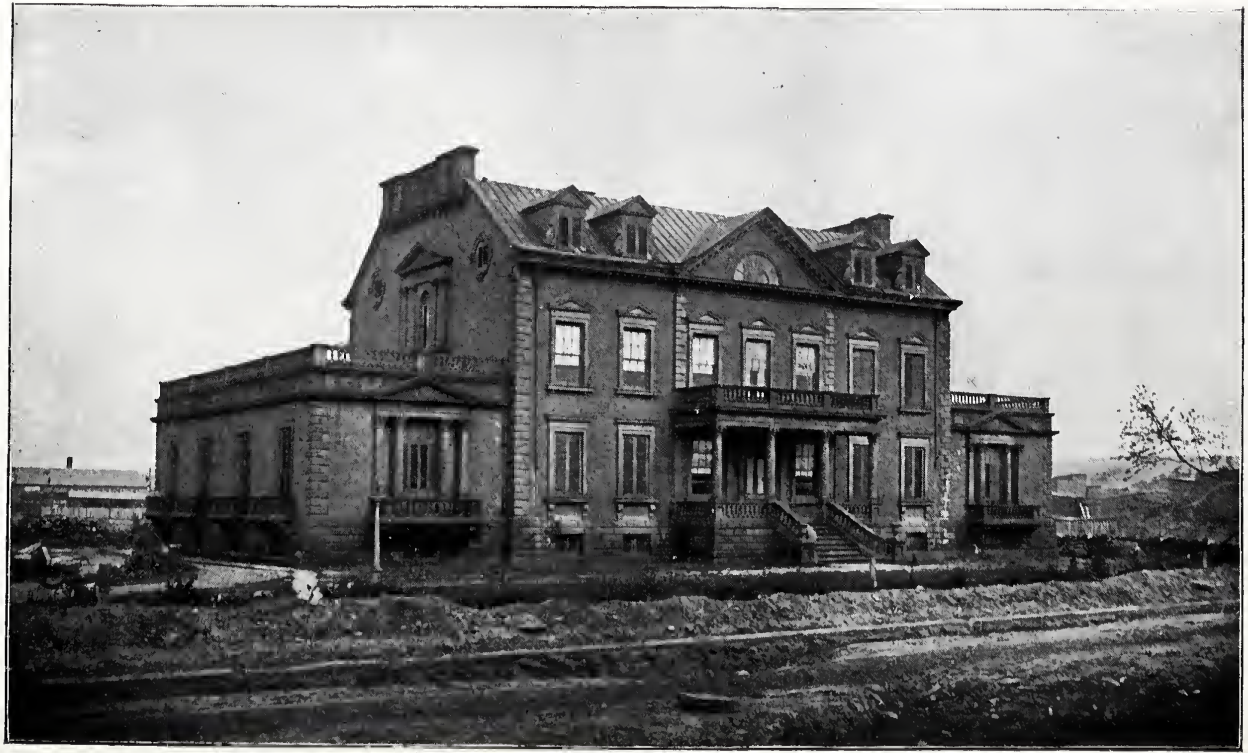
If I have toned twelve whole sheets of paper, I discard the bath as it has done its whole duty, and nothing more should be expected of it.

For a long time it was difficult to get good "ready sensitized paper," so I was forced to silver my own paper, but of late years I find the quality of the ready sensitized paper very much improved, and I use it in preference, as I did not like being a bonanza for the tailors, on account of silver stains. I think if it is fumed about 40 minutes, and care taken in printing deep enough, very few can tell in the finished print if it is freshly silvered or ready sensitized paper. It is necessary to print quite deep. I also find that drying it between sheets of blotting paper preserves the gloss and renders it less liable to show cracks in the albumen. I find if kept under pressure that only the outside sheet on the edge shows any discoloration. I have a box made on the principle of a "deep printing frame," with, of course, a solid bottom, in fact, an old deep frame was utilized by nailing a bottom on for my first one; since, I have constructed one with cams instead of springs, and keep paper nearly a year quite as white as when first purchased. *C. H. Poor.*

A SKETCH OF THE VAN RENSSELAER MANOR HOUSE.

Americans cross the ocean to admire in foreign lands the historic buildings which have for centuries received the world's tribute of interest and praise; but are depriving themselves continually of similar treasures through a blind worship of what is called the march of improvement. It is in this spirit that we are constantly parting with Revolutionary and Colonial relics, in many cases leaving not the slightest record to mark the site of events which have, in but little more than a century, made of the thirteen colonies a nation which, to-day, influences the world. Next year a photographic convention will meet at Chester, England, a city teeming with historic memories. We cannot carry our cameras through streets and on ramparts once trodden by the Romans and point our lenses at a church founded by a daughter of the Saxon Alfred, but we do not retain and care for even what we do possess..

Albany, three years ago, celebrated its Bi-Centennial as an incorporated city, which in America, makes her venerable. Among her valuable historic relics are a few old buildings, most of which have been converted into far other than their original uses. But the home of the Van Rensselaers has stood in almost solitary majesty for years in charge of a custodian. The rooms are almost entirely dismantled, but its stately entrance-hall, about thirty-three feet wide, still holds the staircase and wall-paper made in Holland before we became a nation, and the beautiful, carved woodwork still ornaments the dusty, darkened apartments. A few years ago an interesting May-Day Festival was held under the stately trees which have



Photographed by Miss Catherine Weed Barnes. THE VAN RENSSELAER MANOR. Photo-Electrotype Engraving Co., N. Y.

sheltered the heads of Washington, Lafayette, Jay and other great men of Colonial times, the May Queen being personated by a granddaughter of the last patroon.

The mansion now stands exposed to the open glare of the sun and the destructive power of the elements, for the grand old trees lie prostrate around it and a street is being cut through the grounds a few feet from the imposing entrance. On one side are machine-shops and on another is the Erie Canal, while railroad engines are constantly passing under the windows. The practical world of to-day has sadly encroached on the spacious grounds, and makes it difficult to realize that the building bearing on its southwest wall the date 1765 verifies the adage that figures cannot lie. The destruction of the trees was very recent, about three years ago. The two great wings of the building were added by the son of the last patroon and are, therefore, much more recent than the main part. On each side of the wide hall are two suites of rooms. To the right are the drawing-rooms, the state bed-room and the magnificent library, each with lofty ceilings and beautiful carving. To the left is the reception-room and also the home-room of the family. The great dining-room extends from front to rear of the mansion and the rooms on the second floor closely resemble those on the first, while the third has a large number of smaller sleeping-rooms. The house was built by Stephen Van Rensselaer, fifth lord of the manor from the first patroon Kilian Van Rensselaer, who, it is supposed, never saw his vast American possessions, but managed them by an agent as did his son and successor, Johannes, who also lived in Holland but is known to have visited Rensselaerswyck.

Stephen's wife was a daughter of Gen. Philip Schuyler which made him brother-in-law of Alexander Hamilton. In 1789 he was elected to the Assembly, and was always a welcome guest at Washington's table. Six years later he became lieutenant-governor, and was re-elected for a second term. There was no opposing candidate, as no man in the state, it is said, had a stronger personal influence, and the hardest thing ever said of him was that he was rich. He never attempted to exact unpaid rents from his tenants, and was so universally beloved that, although never claimed by him, the title of patroon was given to him all his life. His interest in the welfare of the State caused his appointment as one of the commissioners to explore a route for the Erie Canal, obliging him to ride horseback from Albany to Lake Erie. In the war of 1812 he and his cousin Solomon held important commands, and on one occasion the wealthy and aristocratic patroon made his bed on a table but little over four feet long, while Colonel Solomon slept on two boards and the secretary in a Dutch oven.

Much could be written concerning the old manor house and the family connected by ties of blood with so many distinguished names in the history of our State and country, but I will not further weary the readers of the ANNUAL. Visiting the grounds recently to photograph the mansion, as I gathered up my impedimenta, an old Irishman, working on the new street, called out to me: "Lady! that house would be better worth taking forty year ago," and, looking on the desolate scene around me, I fully endorsed his words.

Catharine Weed Barnes.

FILM PHOTOGRAPHY.

LESS than half a dozen years ago the amateur photographer, provided with the most compact and convenient camera then available, and an outfit of a dozen of the recently introduced gelatine dry-plates contained in half that number of separate holders, congratulated himself, when setting forth on a day's "shooting," upon the portability, lightness and general efficiency of his equipment, as he might well do, when comparing it with the bulky burden borne by his few but enthusiastic brethren of the preceding decade. Photography thus made easy, proved to be an irresistible attraction to thousands, and the ranks of the amateurs were swollen by new recruits, until they expanded into an army that is still growing with amazing rapidity and strength. Its enterprising members have borne the magic lens and sensitive plate into all parts of the world; into the air above and the waters under the earth, making familiar to the eyes of millions, scenes that, without their aid, would have remained as shadowy mysteries to most of us.

But, speedily, even the comparative lightness and portability of gelatine coated upon glass plates, were found to be quite too great for convenience in protracted journeys, whilst even a day's outing under a blazing July sun, caused many a weaker recruit to long for something still less burdensome than the outfit that erstwhile, he had thought so light and compact.

The first serious attempt to meet this growing demand was made by the Eastman Company in 1885, by placing upon the market their Negative Films, which consisted of a paper support to a coating of sensitive gelatine emulsion. The opacity of the paper of course, made negatives produced in this manner slow printers, whilst the grain of the paper was very perceptible in the finished print, rendering the production of fine details almost impossible. Both these difficulties were partially overcome by saturating the finished negatives with castor oil or other substances, which made them quite translucent. But the operation was a messy and disagreeable one, and had no improvement been devised, it is doubtful if paper-coated films would ever have made any headway against the old, familiar and excellent glass plates. This improvement quickly came, however, in the simple device of coating the paper first with gelatine soluble in warm water, over which was spread the insoluble sensitive emulsion. Nothing could be easier (after development) than to strip the paper backing from the film, and replace it with a thin skin of prepared gelatine; the resultant being a transparent flexible negative, thin enough for printing from either side, unbreakable and weighing almost nothing, as compared with a glass plate of same size. What a boon to the traveller and to the landscape photographer!

In spite of their superior lightness and portability as compared with glass, it is doubtful if the stripping films would have made any great headway in popular estimation had not some special and practical device for convenient and rapid exposures accompanied their introduction to the world. For use in sheets cut to standard sizes, they required plate-holders the same as glass, with the addition of carriers for holding them flat during exposure. The difference in weight between an outfit carrying a dozen glass plates, and one containing the same number of films, was indeed very slight, whilst the bulk was exactly the same. Fortunately the inventive genius that produced the stripping films was equal to the co-incident demand, and a roll holder was issued with the films, capable of containing as many as fifty exposures, in a bulk not greater than that of two plate holders of equal dimensions, and weighing no more than one of the latter, when loaded with two glass plates. The sensitive film, coated upon a long strip of paper, was wound upon a spool placed within the holder; and by simply turning a key the whole number could be exposed without once returning to the dark room for renewal.

These stripping films, filling so well a great and long-felt want, became almost at once immensely popular, especially in England, where amateur photography had many years the start of America. And in proof of their practicability, perfection from the outset, lightness and portability, it may be mentioned that, in the summer of 1886, a friend of the writer's went abroad and made a tour in Germany and Switzerland, carrying with him in an ordinary "grip-sack" a portable camera for 4x5 plates, a rapid Rectilinear lens, with instantaneous shutter, and enough spools of the stripping films for 800 exposures. The result of his work was over 600 excellent negatives, a few unexposed spools, and two months of enjoyable outing. What could he have done with 800 glass plates and a "grip-sack"?

The success of film photography being thus assured, as a matter of course the attention of enterprising manufacturers was turned in this direction, and numerous roll-holders and other devices for making exposures were devised, especially in England. But the most persistent attempts were made to find a substitute for the paper backing, which (despite its advantages) was felt to be imperfect and unsatisfactory. A properly stripped and backed film was as nearly a perfect negative as could be imagined or desired. There was absolutely no halation about it. It was unbreakable, of a feather weight, and a dozen of them could be placed in the same space as a glass negative. But the operations of stripping and backing were undeniably long, tedious and uncertain in the hands of many. Hence the incessant search for a material suitable for a flexible film without the necessity of stripping. Among the many devices, one brought out in England under the name of the Vergara film seemed the most promising. It consisted of insoluble gelatine, was quite even, transparent and beautifully coated. But it would not resist the varying conditions of atmospheric changes, expanding in damp weather, and becoming almost brittle in a very dry climate. So this was but a matter of a day.

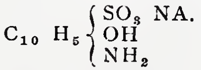
It remained for America to give to the world the eagerly sought for perfect material for a flexible film. Celluloid (the almost ubiquitous substance) was found to be as perfectly adapted to this purpose as to the many others for which it is used. Thin, translucent sheets of celluloid coated with gelatine emulsion, were first placed upon the market in 1888, under the name of "Ivory Films." These were and are manufactured in Boston by Allen & Rowell. It was at once seen that an almost perfect substitute for glass had been obtained, and other keen-witted manufacturer began its use for this purpose. Among these, John Carbutt, of Philadelphia (identified with the gelatine dry plate manufacturers, since its incipiency), has been eminently conspicuous, and his Celluloid films are now exported in immense quantities to England and other foreign countries. All these films are furnished only in cut sheets, corresponding to the various sizes of glass plates commonly in use. They are of moderate thickness, but too thin to admit of use in ordinary plate holders without some special device for holding them flat, many ingenious methods for doing which have been devised. But they are all too thick to permit rolling upon a spool, hence their usefulness and value to the traveller is in a measure curtailed.

Meanwhile, a quiet, thoughtful, earnest little man in Rochester, New York, was ceaselessly working at the knotty problem, and with what measure of success the world now knows. The Eastman transparent film is the result of these protracted labors. Celluloid is the foundation, but has been so modified in the new manufacture that the result is a film transparent as glass; thinner than the paper heretofore used for the American films, and as perfectly flexible, so that it can be wound upon spools and used in the ordinary roll holders. It can be developed precisely the same as a glass plate, requires no after-treatment, can be transported by mail in an ordinary envelope, is unbreakable and without appreciable weight. What more can the most exacting photographer, professional or amateur, demand or desire? And as the world cannot afford to forget the men who have benefited it practically, its Watts's, its Fulton's, its Stephenson's, its Morse's, its Edison's, its Daguerre's, why should not the name of George Eastman be held in grateful remembrance by those who profit by his labors and inventions?

W. H. Walmsley.

EXPERIMENTS WITH EIKONOGEN.

UNDER the designation, eikonogen, a new developing agent has come to us, the chemical constitution of which is not known but supposed to be amido β-napthol-β mono-sulphonate of sodium and is symbolically expressed.



$$C_{10}\ H_5\left\{\begin{array}{l}SO_3\ NA.\\ OH\\ NH_2\end{array}\right.$$

It is manufactured by the Berlin Aniline Manufacturing Co., and patented abroad and in America.

I have been using it several months and have subjected it to many tests, all of which resulted very favorably indeed, and I find myself growing more and more enthusiastic over its many good qualities. It is a coarse, brown powder, very soluble in water, and has many advantages over iron, pyro, or hydrochinon. A negative developed with it looks more like the negatives made with ferrous oxalate developer than any other, and in using it the same methods of accelerating and retarding are employed as with iron; that is, we hasten its action with a few drops of the hyposulphite solution and retard with bromide of soda or potash. The deposit, however, is far finer than could be gained with any other developer. The color of the negative, too, is much better than we have obtained heretofore. With a generous allowance of sulphite of soda to keep the solution clear, the color obtained with eikonogen is decidedly black using either carb. potash, carb. soda, sodium biborate or phosphate as the alkali. The advantage of this black color is that it is so easy to carry development to the exact degree of density required.

The chief claim made for eikonogen is that a plate needs less exposure for this developer than for any other, and this claim appears to be substantiated in my experience. I have tested it in developing pictures taken with a lens of five inch equivalent focus, using a Prosch triplex shutter at the highest speed, and have found it more powerful than anything I ever used, giving wonderful detail, delicate half-tones, and superb printing qualities. I am satisfied that there is nothing to be gained by using a two-solution developer with eikonogen, for if it be made strong in one solution, it can be readily modified to suit any exposure.

Its universal application to all photographic work commends it to those who wish as few chemicals as possible. With the same solution I have developed negatives, bromide and chloride prints, lantern slides on gelatine and collodion emulsion plates besides other forms of positives, obtaining *better results* than ever before. Its stainless quality, too, will make it many friends. An old solution is just as clear and stainless as a new one and will stain neither the gelatine or the hands unless used with insufficient sulphite. The only discoloration that can happen to the plate is in case of under-exposure with protracted and forced development. In this case green fog is almost sure to ensue.

Users of eikonogen are cautioned not to admit any form of ammonia or any acids in preparing developer.

My formula is:

Sulphite of soda to test 60 deg. hydrometer.
Carb. soda to bring this solution up to 80 deg.
Add six grains eikonogen to each ounce of above and filter.

For bromide prints and other positives use phosphate of soda in place of carbonate and dilute one to three. The hydrometer used is the ordinary actinometer, testing zero in water at 60 deg. For quick exposures I generally use the developer as it is, but for timed work it should be diluted. A few drops of hypo from the fixing-bath will hasten the action very greatly and beside, gives a certain softness that is a decided advantage. For density, transfer the negative to old developer or to a tray containing a strong solution of bromide of soda or potash. Old developer should be saved for transparencies and for imparting density.

Eikonogen, it may be safely said, possesses many good qualities, and probably as we become better acquainted with it many more will be discovered. I think it deserves a high rank among photographic developers. *Edward W. Newcomb.*

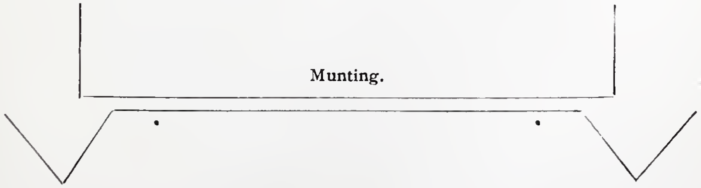
TWO DODGES.

I.

To SAVE time in packing bottles take ordinary cotton batting of a width corresponding to the height of the bottles and cut it of the right length to reach around them. Wrap the cotton around the bottles and outside of that roll a piece of straw-board or pliable pasteboard. Wind with string, using a slip-knot to draw up tight so that the sheath cannot slip off the bottle. Get a box just large enough to hold the bottles crowded close together. They can be thus packed in much less time and space than is possible in any other way.

II.

To Stop a Leaky Sky-light.—Have a tinner provide a sufficient number of pieces of tin 1¾ inches wider than the *munting** to reach the full length, and have him solder them together at their ends. Then with a cornice brake form a V-shape gutter on each edge, so that the edge of the munting will extend in to the gutter, and be sure to catch the drip. Tack on the underside of the munting as shown in sketch.



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*MUNTING.—A vertical piece in a frame of a door separating the panels.—*Webster.*

The upper lines represent the edge of the munting, and the lower ones the tin. The dots represent the tacks driven up through the tin into the munting. The water can be carried to outside leaders if desired. If painted the munting "drip catch" will be quite durable.

J. W. Pendergast.

REMARKS ON THE AUTOGLYPHIC OR HALF-TONE ENGRAVING PROCESS.

Yesterday, as I sat is a restaurant, in company with some friends at our mid-day meal, a peddler entered the room, and catching the crowd in a spirit of unusual hilarity, he was permitted to display his wares. From a paper-covered bundle that was swung over his arm he slipped out a number of prints, which he vaunted as "steel-engraving photographs," a term that naturally very much amused me, posted as I supposed myself to be in the ins and outs of the graphic arts, and particularly in the mysteries of photographic processes.

The prints were lithographic reproductions of steel engravings, including a number of well-known pictures by German and French artists, reproduced by what was probably some modification of the anastatic process, and printed in all likelihood from zinc. Five cents apiece was the price for the pictures on 18x22 paper of good weight and quality, and out of that five cents the "fakir" and the jobber, the printer and the paper manufacturer had each to make a profit.

One of our party having in mere sport bought a pair representing Rideaux's "Fishing" and "Hunting" scenes, presented the prints to me, and on my saying laughingly that I would find it embarrassing to throw them away, and doubly so to carry them home, he remarked more soberly that their cheapness didn't detract from their beauty, and that twenty-five years ago they would have been worth five dollars each, and would have found a place on the parlor walls of men richer than any of our party. That was true, and its significance, while well calculated to "point a moral and adorn a tale," may yet more signally serve as an index of the marvellous advances latterly accomplished in this field of combined industry and art. Great as has been the development of every feature of our modern life, it is impossible to revert to any single direction of human effort which has done so much towards raising the masses to the culture-level of the classes, as the achievments of Science in the domain of the Graphic Arts.

Just fifty years ago Daguerre's discovery was published to the world, and in the same year Mungo Ponton recorded the first notice of the light-sensitive properties of chromic compounds. Twenty-five years later the germs of the collotypic processes were just being hatched out, and to-day the brood of photographic, collotypic and chemi-glyphic processes has become so numerous that only a special committee of some future pan-graphic convention will ever manage to get their very names untangled.

Latest, and perhaps the greatest, amidst this fast increasing legion of accomplished facts is the "half-tone," the "cross-line," or, as I proposed some years ago to term it, the "autoglyphic" process. Autographs of the original subjects in engraved form these pictures are; "autoglyphs" in the fullest sense of the word, and hence the name. Numerous other methods produce "half-tones"; these autoglyphs can be made with grain or stipple as well as "cross-line." To term them the "Jonestype," the Browntype," or the "Smithtype" process would be absurd in view of their history, and, therefore, it is desirable that some sensible generic term be chosen by which to designate this new achievement in the Graphic Arts. I am not unaware of Meissenbach's deserts in connection with the development of these newest methods of graphic reproduction, and am cognizant of much, at least, of what has been accomplished in the same direction by others on both sides of the Atlantic. It is, however, too early in point of time and too late in point of my allotted space to permit an historical disquisition of the subject.

To those practically interested in its application, a few words regarding its technics may be of moment. The screen of alternate opaque and transparent lines may be used over the picture to be copied outside the camera, or in the plate holder, close to the sensitive plate. The picture may be copied directly by reflected light, or a diapositive of it can be prepared, and the lined negative produced from it by transmitted light. The latter procedure is preferable for quality of result, the former for rapidity of execution and saving of labor. The important prerequisite to quality in either case is a perfect line screen. A photographic copy of a line "tint" reduced from a coarse-ruled original to such a degree that the lines of the screen number from 110 to 140 to the inch, is the simplest screen that can be devised; but simple as this procedure appears, the process is very difficult in practice, by reason of the fact that the slightest variations from perfect regularity of the alternate lines and spaces become accentuated in the copy, and increasingly so in proportion to the degree of reduction. Hence, in advanced practice, a line screen ruled with the requisite number of lines directly in a ruling machine of proper construction is found to be necessary. The first requisite of such a ruling machine is a perfect, or rather a "perfected" screw. A *perfect* screw is almost an ideality; there have been constructed a few that approached pretty nearly complete perfection, to be used for ruling micrometric scales, and more especially for ruling diffraction gratings; but the screw for ruling an autoglyphic screen-plate will be sufficiently accurate when ordinarily perfected. This is accomplished by grinding a lathe-cut screw with a long segmented nut until all variations of pitch have been practically eliminated.

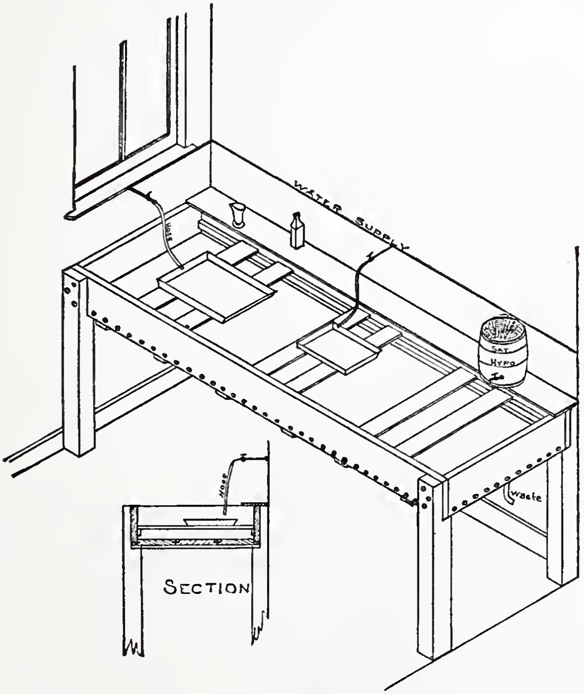
The most perfect line screens that I have thus far devised are made by ruling a tint on a piece of thin mirror-glass through a film of wax, and then etching the glass with hydrofluoric acid. Printing ink is then rubbed into the etched lines, and the result is a screen of perfectly opaque and transparent lines, clearly and sharply defined. The screens produce by far the most satisfactory results as compared with any obtained photographically. I have projected the making of an optically perfect sieve of cross-lines by making an electrolytic deposit on the etched depressions of a cross-lined plate, prepared as above noted, which would give the opaque lines without the diffracting or reflecting effects of the glass screens, but have thus far not had the time to carry this design into execution, and am not altogether assured that the gain in result would compensate the effort.

The development of the autoglyphic process is manifestly destined to mark a more important era in the progress of the Graphic Arts than any other method of graphic reproduction since the inception of photography itself. Its influence in the dissemination of intelligence is already making itself felt in the pages of standard and current publications everywhere, and its value as an adjunct in raising the standard of art culture and of artistic appreciation, is commensurate with its almost limitless possibilities. It is the graphic method of the future, combining as it does, in a higher degree than any other, the illustrative and the æsthetic elements of art.

Louis Edward Levy.

ANOTHER MAN'S DARK-ROOM.

Having for many years made the bath-room at home serve as a dark-room for photographic chemicals and apparatus, to the detriment of paint, the ruination of zinc bath-tubs, and the total banishment of Job-like patience once possessed by the female members of my family, it was with a deep sigh of relief I was ushered into an empty room in the third story of the house which the family had vacated for my own individual use, the only stipulation being that I should vacate the bath-room forthwith, and if any bottles or dishes were found there in the future there would be—well, some of you who read this are married.



My new dark-room is an L shaped one, there being a space of eight feet between the two sides of the top of the L, with a window on each side. My photographic pocketbook having a very emaciated look about that time, I decided to fix up the dark-room without the service of carpenter or plumber. The first piece of furniture necessary was a sink: A common cast iron kitchen sink would be too small, and meant occasional pools of water on the floor, which would run through to the best bedroom beneath, so I decided to build a wooden sink to fill in the whole eight feet space between the two windows. At the mill I got three pieces of white pine, size eight feet by ten inches by one and one-half inches for the bottom of the tank, two pieces eight feet by ten inches by one and one-half inches for the sides, and two pieces thirty inches by eight and one-half inches by one and one half inches for the ends.

The two joints in the bottom of the tank were grooved on their inner edges, into which a strip of lath was fixed. These grooves were filled with white lead, and the tongue strips placed in position, and by means of a pair of door clamps the three pieces of lumber forming the bottom of the sink were drawn tightly together, the surplus white lead being removed from the joints. While still in the clamps the three pieces were braced firmly together with pieces of floor boards thirty-three inches long, allowing a lap over each end of the bottom of the sink of one and one-half inches. Countersunk screws placed every three inches prevented possibility of the joints coming apart and allowing leakage. The edges of the tank were planed true. The ends and sides of the tank were next firmly fixed to the bottom of the sink. Three inch screws two inches apart, the joints being first thoroughly smeared with white lead mixed with linseed oil (taking care not to have it too thin), the inside corners being well filled in with the same material. Good solid white pine legs were screwed firmly to the sides of the sink, the bottom of which rested three feet from the floor at one end, and two feet eleven inches at the other, to allow for drainage.

A narrow strip of wood eight feet long was screwed to each inner side of the sink, three inches from the bottom, upon which pieces of floor board three feet long, upon which are placed developing trays, etc.

The inside of the tank was found to be perfectly waterproof after receiving four coats of asphaltum varnish, the outside of the tank receiving one coat.

At the bottom of the sink, close to the lower inside edge a two inch hole was bored, through which was forced a piece of two-inch lead pipe, the upper end protruding about a quarter of an inch above the bottom of the sink (the diameter of the tube made larger by means of a cone-shaped piece of wood) and afterwards hammered flat to the bottom of the sink, and receiving several coats of asphaltum varnish. A hole was drilled through the brick wall directly under the sink outlet, through which was passed a piece of garden hose, one end being attached to the lead pipe connected to the sink, the other end leading into the rain pipe which happened to be underneath the window.

The windows at the sides of the room are covered with ruby fabric, first at the bottom three thicknesses, twelve inches wide, above that two thicknesses, and above that one sheet. A window shade of opaque material on spring rollers allows the requisite amount and quality of light to enter the room. A piece of iron pipe placed in the sink hole, the top being about two inches from the bottom of the sink, serves to keep the bottom of the sink moist, and prevents all possibility of leakage; otherwise the joints would be apt to dry and perhaps crack. The writer has had this tank in operation for over twelve months, and it has not leaked a drop up to date.

I keep a saturated solution of hyposulphite soda in a small cider keg, which has first been thoroughly coated with melted paraffine inside and out. The keg is set endways on a shelf above the sink; a bag formed of mosquito netting inserted into a hole in the top end of the keg and held in place by a cane hoop. The bag extends downwards about six inches inside the keg, and after being filled with hyposulphite of soda, the keg is filled with water, the hypo being replenished from time to time as it dissolves, until the water will dissolve no more. A pewter or wooden spigot about an inch from the bottom of the keg allows the solution to be drawn off as required, one ounce of the saturated solution to about ten ounces of water being found sufficient to fix plates, bromide paper, etc.

The coat of paraffine prevents the hypo solution from forming crystals upon the outside of the keg and around the spigot. A few gallons of saturated solution of hypo will last many months, and save an immense amount of time and trouble.

W. N. Jennings.

EXPERIENCE WITH EIKONOGEN.

Having recently made a number of instantaneous and quick exposures, I thought it a good chance to test the new developer, Eikonogen. A circular giving formulas was handed to me at the Boston Convention, and with this as a guide I first tried the separate solutions as follows:

a.—	Water	30 ounces
	Sulphite soda	2 ounces
	Eikonogen	1 ounce
b.—	Water	30 ounces
	Carbonate of soda	1 ounce

This I used in equal parts. The image came up promptly, but was slow in getting density, and in fact in a number of cases did not reach that density necessary to get a brilliant print from. I then washed the plate and finished with soda and pyro developer, as usual, getting as much density as I desired. To several exposures that were made on dark subjects, I added the hyposulphite solution 1 part to 70 of water, 8 to 10 drops to about 8 ounces of developer making absolutely no change in the effect.

I found the above formula no improvement over pyro. In fact, it was not as good on quick instantaneous exposures. I then prepared the following, in one solution:

Sulphite of soda	2 ounces
Carbonate of *potash*	1 ounce
Water	30 ounces
Eikonogen	1 ounce

The first plate began to show the image within 10 seconds and developed up rapidly and to any required strength. Taking one of the same subjects, made under precisely the same conditions, I developed it with pyro and soda, getting about the same effect as the eikonogen, only slower.

I carried through the same treatment as above, with six pairs of plates, using one each with pyro and one each with eikonogen. On comparing them in a good light, I confess there was very little difference, the pyro being equal to any of the eikonogen developed plates. The latter were a trifle clearer in the shadows, and I judge would be preferable for a positive as the color was so rich a gray black.

All the plates used in the foregoing were Cramer's, lightning 50 sensitometer. The deposit was exceedingly fine, and, from my experience, I should say the eikonogen would yield a negative for portraits that could not easily be excelled.

William H. Rau.

FOCUSING WITH JUDGMENT.

In focusing we bring the ground-glass into the plane which coincides with the sharpest projection of the image.

Analyze nature's panoramas into masses and values. If you constantly practice this you will find that it will become a habit which is absolutely necessary for artistic work. It is by this that you will learn to know what is suitable for pictorial art, and what is not; for if the masses and values in a picture are not correctly expressed, nothing will ever put the picture right.

In focusing one should always look at his subject with half-closed eyes before focusing on the ground-glass, and then try and get the same effect of masses on the ground-glass without interfering with his forms, whether landscape or figures.

Nothing in nature has a hard outline, but everything is seen against something else. In this lies all charm and mystery of nature; this is what the artist seeks, and what the photographer, as a rule, avoids.

G. J. Stengel.

A SIMPLE PLATE LIFTER.

Procure a strip of tin about three and a half inches by one inch, and bend it as shown in figure 1, so that when the lower piece is laid flat on the bottom of the developing dish the upright portion rests against the side and the top part projects over the side of the dish. This will in no way interfere with the plate or solution, but on pressing the projecting piece it acts as a lever on the edge of the tray and raises the plate out of the solution.

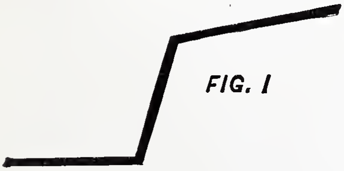
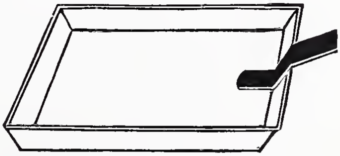


FIG. I



C. C. Vevers.

PHOTOGRAPHING IN THE ARCTIC REGIONS.

On an extended voyage at sea, time is generally as plentiful as salt water, and to the photographer who has dozens of exposed plates on hand awaiting development, it is impossible to resist the inclination to utilize some of this time, at least, by seeing how the pictures are " coming on." But when actually work has begun, he will be shocked beyond measure to find himself limited probably to a pitcher full of water a day. Arguments will be useless, for the captain will hold the comfort of his passengers nearer his heart than the happiness of one camera " fiend."

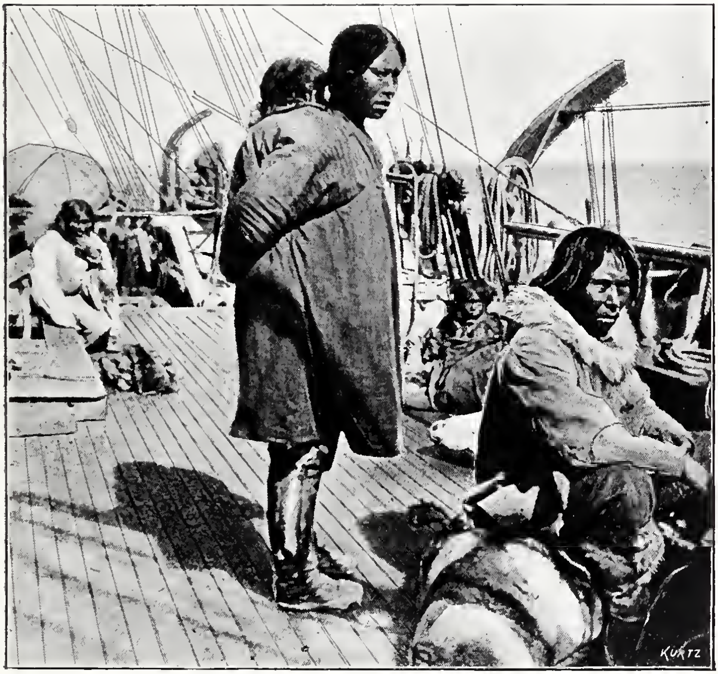
We were away on the arctic voyage eight months, so of course required a supply of water to last during that period for thirty-six men. Naturally there was little to spare for photographic purposes. We had weather of all varieties. On the Fourth of July in Behrings Strait the thermometer registered 85 degrees above zero in the sun. Only a short time before the thermometer had stood 10 degrees above zero. In the Arctic that means a temperature equal to if not colder than 20 degrees below zero in New York, owing to the great humidity of the atmosphere and fierce winds. In September it was so foggy that the man at the wheel could not see the foremast, and by the first of October the cold penetrated every part of the ship, so developing and washing negatives involved dangling one's fingers in freezing water.

Dark-room facilities were easily provided. The only trouble was the supply of fresh water and the temperature, which was ever changing and making development more uncertain.

Had I not continued developing my pictures under these adverse conditions, I would have had about eight hundred undeveloped negatives on hand. So rather than accumulate all this work I ran the risk of the results and kept the developing nearly up to the exposures made.

Salt water answered well in washing the plates. Sufficient fresh water was out of the question, but by washing thoroughly in salt water, then rinsing thoroughly in fresh, as good results seemed to be obtained as though fresh water only had been used.

Then another difficulty to be encountered at sea is the excessive dampness which affects everything. My plan was to make fresh developer from the dry chemicals; every time as soon as a box or bottle of chemicals was opened moisture



Photographed by
Herbert L. Aldrich.

A GROUP OF ESQUIMAUX.

Wm. Kurtz, N. Y.

was almost sure to ruin the contents long before I had used it in spite of the most careful corking, covering, wrapping, and other precautions.

On a sea voyage the developer cannot receive too great care. A hypo eliminator might be a good thing, provided it was not affected by chemical or other action on the part of salt water. The camera which I consider most adapted to such a voyage is a Scovill detective, yet there are times when one would sell his kingdom for a 6½ x 8½ or even larger size camera. With a large size camera I might have got some wonderful pictures of ice-formation. These were views which a small camera cannot do justice to. But, of course, such a large camera increases the bulk and weight of one's baggage considerably.

One day when we were anchored on the Arctic shore of Siberia the usual motley company of the Eskimo were on board. They watched the mysterious workings of my detective camera with suspicion. After getting several pictures I adjourned to the deck-house with my developing outfit to see what the results were. They were somewhat frightened when I covered up the window with yellow paper, and after I closed the door they tried to get a peep into the mysterious room.

One woman who had tried to look through the keyhole, then under the door, and finally had almost smashed the window in, said:

"Capt'n, me want see."

"All right," said he, as he walked away.

Pretty soon she accosted him again.

"Capt'n, me want *see.*"

"Well," said he, "go and see then."

But she did not see, and to this day what I was doing in that dark-room is to her a mystery

H. L. Aldrich.

TENTATIVE DEVELOPMENT.

In coming to conclusions regarding phenomena in photographic processes, I think all, even our master minds, are liable to fall into the error of saying, "*Post hoc, ergo propter hoc.*" This is notably the case in the development of the invisible image on the bromide plate, the conditions of which process are never twice alike.

A slight change is made in the developer and a good result is obtained, therefore the good result was caused by the change in the nature of the developer. How do you know? Well, another plate which I developed the other way was not so good. Yes, but how do you know that if the plate on which you gained the good result had been developed in the other solution, you would not have had a still better result?

You don't know and can't positively say yes or no. But, some one replies, the character of the action of the chemicals used is so exactly known, that we can make a very good guess at what the result will be of a certain modification. I believe that the modifications of the extremely dilute solutions used in development, do not produce as marked results as we imagine. We have heavy foliage or draperies, and so we are advised to start with a minimum of pyro, in order to get detail; we do so and get a good result. We have a subject with light draperies and surroundings, and we want then, according to the theorists, to pile in the pyro at the start; we do so and get a good result. Great is tentative development and wise are its prophets! Some go even further and say: "You don't know, and can't tell whether your plate is correctly timed or not; therefore bring out the details first with weak pyro, and aftewards add pyro at the proper time to get intensity. This school is led by Burton, Ehrmann, and Abney. Another school asserts that you can't tell to a certainty whether your plate is correctly timed or not; therefore start your plate in a developer weak in alkali; the pyro will not restrain your plate; if it is under-timed you can, as soon as you discover it, add more alkali and get a perfect result; if it is over-timed keep right along in the same developer, and the pyro will act ahead of the alkali, and bring out the plate perfectly; this idea is supported by some leading practical photographers. By all these methods good results are obtained, therefore the votaries of each system claim specially good results for their pet idea.

I was much taken with the latter idea when I first heard it, and used it in regular gallery work for a week or two, when one day a doubt about it entered my mind, and forthwith the batch of the day was developed in the normal developer without changing from one solution to another, with results equal to, or excelling, those developed by the tentative process. But that was not a scientific test; so I took tissue paper five inches wide, and folded it to make a pad 5 x 7 inches, ranging from one to sixteen thicknesses. This used as a negative gave me on albumen paper a series of gradations from white to black, representing eighteen values (adding on pure black and pure white one on each end), each value being all the way across the plate, and about one-third of an inch wide. Exposing a plate (5 x 7) so as to reproduce it exactly in size and values, I then cut it in three pieces lengthwise; two I put into developer having only half the usual quantity of alkali, and one I put into normal developer. They were numbered 1, 2, and 3, respectively; No. 1 was developed entirely in solution weak in alkaline; No. 3 in developer made after Cramer's formula; No. 2 was started with No. 1, and when the high-lights were well out, was put into the dish with No. 3 and finished; when they were all sufficiently dense they were fixed and results compared. No. 3 (normal developer throughout) gave much the largest range between light and shadow, had best detail at both ends of the plate, and was the best reproduction of the original. There was little or no difference between 1 and 2, and they were much inferior in every respect.

Later on I became enamoured of Abney's argument in favor of starting some kinds of subjects in weak pyro, but I thought I would make a comparative test before coming to conclusions; so one day a lady insisted on having her child, who was dressed in white, taken in a large, maroon plush arm-chair. I exposed four plates (Cramer 40) as fast as my shutter would work; two I developed à la Abney, and two with the developer recommended by the maker of the plates, a plain no-change developer. I was rather astonished to find, that, for printing quality they were nearly alike; the only difference was a trace of fog on the plate developed Abney style, *which flattened out the high-lights a little.* This was startling, but to verify it, and leave no chance for doubt. I made the same test as in the other system. The result was as before; the normal developer gave the best results, more depth of shadow and strength of light, with better detail at both ends. In this experiment, one piece was developed with weak pyro, one with weak alkali and the other in normal, resulting in a complete shattering of my faith in tentative development, and in my forming a resolution to bend all my faculties toward getting the time and lighting, that would give in a standard developer the values which I desired in my finished picture.

When I stopped to reflect I remembered that Cramer's developer represents a 2.25 per cent solution of carbonate soda, and .06 per cent of pyro. Surely it is not to be expected that a change of one or two parts in a thousand, or even in a hundred, is going to make any material difference in such a comparatively impenetrable substance as gelatine. *R. W. Harrison.*

EIKONOGEN DEVELOPER FOR BROMIDE PAPER.

Heretofore manufacturers of bromide paper have exclusively recommended the ferrous oxalate, so long known as the first developer for dry plates, as the best developer for the paper. The objection to it is that it is slow, is apt to leave an iron deposit in the whites, almost imperceptible to the eye, thus degrading or staining them, unless great care is taken in flowing the print immediately after development with a weak solution of acetic acid, which dissolves out the iron. Even this is not always sure; for if the developer has stood for some time it quickly deteriorates.

A new developer recently prepared and which has come into great favor by those who have tried it, proves that it is greatly superior to oxalate and iron in two or three respects.

First. It does not rapidly deteriorate, but remains clear and retains its vitality as a developer for a long time.

Second. It works much more rapidly than oxalate.

Third. It does not stain or degrade the whites in the least, does not stain the paper itself, and with a properly made emulsion does not fog even with under-prolonged development.

Fourth. In cases of over-exposure, especially in line work or in copying drawings by contract, it does not clog the fine lines up as is noticeably the case with oxalate. Therefore for commercial work it is more easily and certainly used than oxalate.

Fifth. There is greater latitude than with oxalate.

The developer, as now used by a large firm in this city, in place of oxalate, which has been in use for a long time, is made up in about the following solutions:

Solution No. 1.

Eikonogen	16 grains
Sulphite of soda (crystals)	32 grains
Water	1 ounce

The sulphite of soda is first dissolved, then the eikonogen.

Solution No. 2.

Carbonate of potash	168 grains
Water	1 ounce

To make eight ounces of developer take six ounces of No. 1, to which add three drams of No. 2 and two ounces of water.

In case it acts too slow add one dram at a time of the potash solution, till the speed of development suits you. Should the density in the shadows be too weak, keep the print in the developer longer till they come up to suit. If they do not, then add an ounce more of No. 1. Slightly under timing may thus be remedied by increasing the amount of potash. Carbonate of soda will answer equally as well as an alkali, but it has been found advisable to increase the amount of sulphite of soda nearly twice. Potash is used because it is more powerful and does not stain.

The formula given is intended more for line work where brilliant contrasts are desired. For enlargements it is probable the amount of eikonogen may be reduced, say one ounce of No. 1 to four or five ounces water. The developer used one day is preserved and used as an old developer the next day to start the prints in. The color of the developer (a dark green) is deceptive to the eye, making one think it would surely stain the white paper or the fingers, but it does not. The new developer is bound to work a revolution and enable amateurs to produce prints or negatives easier and better than heretofore.

F. C. Beach.

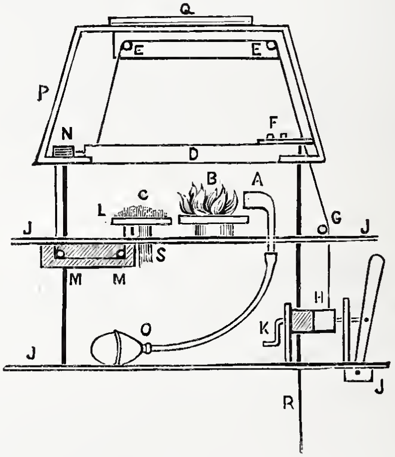
FLASH LIGHT PHOTOGRAPHY.

So MUCH has been written upon photography with magnesium light—the fact is I have written and said considerable myself—that I apologize for giving the ANNUAL readers a few facts on what might be termed my "hobby."

The fundamental principle underlying all operation with magnesium is to secure the full power of the illuminant used. During the past year all experiments and inventions have been directed toward the perfection of lamps to burn pure magnesium. Such lamps meet the requirements in average-sized rooms, but fall very short of the purpose for which they were designed when used in large halls, thus proving the full power of a flash is not to be gotten from any lamp. The perfection of a light and apparatus for this class of work has been a source of constant experiment during the past year. It was needed especially in the photographing of scenes upon the stage of a theatre during the play, without any special call of company being required, as was the case when electric lights were used, at heavy expense, and with only passable results.

My first experiments were made with the *Scovill's Flash Compound*, which I found superior to any commercial powder in the market—and while results were satisfactory I thought an improvement could be made by the addition of some ingredient which would improve its usefulness. This resulted in my preparing a flash-compound attended by more actinic power. By its use it is possible to photograph a stage forty feet wide, with only forty grains of compound. The back part of the stage is at least 120 feet from the flash light. The powder and plate are both orthochromatic, working in perfect harmony, and results are superior to any photograph of colors by daylight.

By referring to the illustration the apparatus used may be seen.



C is an iron plate supported by a spindle and held in position by a spiral spring. Upon this plate is placed the flash compound. *B* is a pan containing cotton saturated with alcohol. *A* is a tube and bulb to force air into the flame produced by igniting the alcohol which in turn ignites the magnesium flash at *L*. Attached to *L* is a cord running over two pulleys down to reel *H*. This reel is divided into two (2) sections, one of which is a loose pulley, kept in perfect contact by two dowels or pins at the point of division. To the loose side of pulley *H* is attached a cord and weight *R*. At the instant of combustion of flash compound on plate *C* the cord *M M* releases a spring at *N*, which in turn pulls back a catch and allows the trap *D* to rise as the smoke ascends. The trap *D* is dropped by an outward pull of the lever attached to reel *H*, thus confining the smoke within the reservoir. At *K* is a crank for re-winding of the weight *R*, which is held in position until a push on lever *I* brings the dowels on reel *H* together. The spiral spring *S* brings the flash plate in position for another exposure. At *Q* is a cover to be taken off to allow the escape of the smoke where it will not be offensive. The whole device is supported by uprights at each corner passing through platforms *J J J J*.

At the present time in the laboratory of Thomas A. Edison is being made an electric igniter to take the place of pneumatic tube and alcohol flame. This I hope to describe to the readers of the Photographic Times at some future day.

A. Peebles Smith.

UNRECOGNIZED POSSIBILITIES OF CELLULOID FILMS.

For some time past I have been resuscitating a branch of photography in which, several years ago, I felt great interest, but which I was compelled to relinquish for want of the material necessary for its working. That branch was the production of panoramic photographs, and the material in question was a stiff flexible film. Sheets of talc, coated with collodion were what I then employed, but these were so very difficult to obtain of any reasonable size, free from blemish, that the experiments were discontinued. But I still have in my possession fully exposed instantaneous negatives, embracing an angle of 120 degrees on the base, which attest the success attained at their discontinuance.

When celluloid was introduced as a support for the sensitive material, I at once saw that in this lay the practical solution of the difficulties which had previously stopped the way; and I now purpose to explain briefly some of the methods by which I am utilizing it in panoramic photography, as a substitute for the long discarded talc or mica.

When a film is bent in a cylindrical form and the lens is made to rotate on its centre, it is readily to be conceived that when the axis of the lens is in the direction of the side of a curved film the image will be formed under conditions precisely similar to those by which the center is impressed. To shield the film from all but the axial rays it is necessary that a thin chamber, having at its back a vertical aperture the height of the plate, shall be affixed to the lens and be made to travel along with it, so as to prevent any light from reaching the film but that which passes axially through the lens.

I have devised various means by which a flat flexible film shall be temporarily bent into the required curve. One of these consists in dropping the film into an aperture straight at the top, and, when down in its place, then liberating a pusher behind, by which the film is forced forwards against two curved faces, one each at top and bottom. After exposure the pusher is withdrawn and the film, resuming its original flat form, is removed to make way for another. In one camera of this nature which I have made, the sides are formed of opaque rubber cloth, the lens being screwed on the narrow movable box which, as I have said, must be the height of the film.

Each part of the film is impressed in succession; but as I employ the full aperture of a very quick acting portrait lens, and as the time occupied in rotating or moving it from one end to the other may be much less than half a second, and further, as the vertical slit through which the light reaches the film is under a quarter of an inch in width opposite the foreground, and half of that for the sky, the great rapidity of the exposure given to any one portion of the film can be conceived.

Carrying out this idea in another way, I have in the side of the camera a vertical slit, into which I push the end of the film, which then enters grooves in top and bottom curved to the required radius.

I have further utilized this principle of bending the films during exposure in taking—not panoramic but—ordinary negatives, by placing them in metallic sheathes or carriers having a very slight curve, these being used in a common camera having a quick acting portrait lens. *All* lenses of this nature, as opticians well know, when constructed so as to give marginal definition of the highest class, must project their images on a hollow field, any attempts to flatten the field being attended by marginal indistinctness caused by astigmatism—the full aperture of the lens being presupposed. The slight cylindrical form given to the film quite meets this difficulty, and enables a negative, sharp from centre to margin, to be obtained by a portrait lens with full aperture—an immense boon when one desires to take a snap shot in a dusky light.

These remarks are merely suggestive, and not intended to be exhaustive, as I quite recognize the great mechanical ingenuity of my American brethren, who, if so inclined, can give excellent practical force to them.

J. Traill Taylor.

HINTS TO BEGINNERS.

To THOSE who indulge in photographing for pleasure only, I strongly advise the use of a good hand camera, as it is the cheapest and best in the long run, and for those who go in for making lantern slides it is just the thing for them, and for those who wish to have large prints it is quite easy to enlarge and get results that can hardly be told from direct prints; at least I can do so, and if I can, others can also make them.

When getting your hand camera it is necessary to have a good one. I strongly advise a short focus lens, not *over* five inches focus for a quarter plate. I have tried numbers and always found the short focus lenses to be the best; the one I use is a four and one-eighth inches wide-angle, and I can enlarge from my quarter plate negatives up to eight by ten, even when using ^{f}, and get good and sharp results, so that my friends cannot tell the enlargements from the direct prints.

A good shutter is required and I think one working in slot of the lens the best, but it must have only one movement, that is, to go from one side to the other, or a simple drop; any of those shutters that rise up and then fall are *no good* for instantaneous shots. The shutter should work from the $\frac{1}{200}$ of a second to one-half or one second and be made so as to give time exposures as well.

Many people think that a hand camera is for instantaneous work only, but that is a great mistake, as when I am on my travels I only carry my quarter plate hand camera and take a light stand with me; and then any object I require to photograph that will let me give a time exposure I do so, and when I return I print by enlargement up to 8½ by 6½ or 8 by 10.

Of course, as most photographers know, hand camera work is my hobby, and so I always have something to say about it. But I certainly would not travel without one, as it's easy to carry and is always ready for a shot, and you are able to get photographs that you could not possibly get without it; besides, as you have not to focus (it being at a set focus), you are able to get groups, etc., etc., in natural postures, as you can do so before they move or start to look at you.

We now come to the development, and here, like doctors, we disagree, but by so doing we learn. I for one do not believe that it is possible to get as good results with using hydrochinon for instantaneous work as it is when using pyro, and feel sure that for the quickest instantaneous work that pyro and ammonia is not to be beaten. Any way quinone will not give as good results for developing negatives as pyro, but for lantern slides and transparencies it is not to be beaten. When I have to use quinone for negative developing I use a formula of my own which is very simple and very good, and is the only developer I find of that sort that gives a good or rather fair negative *without any clear glass*, as clear glass in a negative is a mistake; in fact, as a rule, the worse the negative looks the better it prints, and if you get what you may call a pretty negative you will never get a good print from it.

The formula I use is

Hydroquinon	2 drams
Metabisulphite potassium	1 dram
Water	make up to 10 ounces

For use for instantaneous work I take, say 1 ounce of a saturated solution of washing soda, and put in one dram of quinone solution (no bromide). This is slow but good. For time exposures use half saturated solution of washing soda, viz: 1 ounce of saturated solution washing soda, 1 ounce of water, and 2 drams of quinone salt, and if over-exposure is suspected, add a few drops of a 10 per cent solution of bromide. This last part of the formula does very well for lantern-slides and bromide prints, and gives a good black tone with the right exposure, but by over-exposing, and using more bromide, you can get a good brown tone on either slides or bromide prints.

It is best to use an alum bath after the hypo, but mind and wash well before doing so.

Printing.—I do all mine on bromide or platinotype when using 8x10 negatives. I print in platinotype the smaller ones. I enlarge or print direct on bromide. The chief point in bromides is not to over-expose, as, if you do so, you can never get a good tone.

I find the best result is got on bromide with the iron developer; you can at times get good results with quinone, but if you require to be sure of getting good tones in all your prints you must use the iron developer. I do not find it necessary to use new developer for each print but use one for about four prints, and then mix new.

I find I get far the best result and tone by using proto sulphate of iron and ammonia instead of sulphate of iron as usual, and besides you can develop five or six prints with the same devoloper and still get a good black tone. For use I take

Saturated Solution Oxalate Potash
Saturated Solution Proto-Sulphate Iron and Ammonia

for use take

Oxalate Potash	5 ounces
Proto-Sulphate Iron and Ammonia	1 ounce
10 per cent Solution Bromide	3 to 4 drops

I do not know if this is any thing new and I do not know of any one else who uses that developer but I can strongly recommend it. *A. R. Dresser.*

THOUGHTS SUGGESTED BY A SUMMER'S USE OF CELLULOID FILMS.

Mr. John Carbutt, the maker of films I am using, has said that he has been in the habit of coating them on the mat side of the celluloid film to avoid "halation." All the films I have of his make are coated on the mat side and some show halation in a marked degree. Two negatives of the same subject, in both a little girl dressed in white sitting in full sunshine on the edge of a garden vase, is smudged out of all semblance of her own pretty self by this same "halation," the light having spread all around the glaring white dress. One, being a drop-shutter shot, is less so than a time picture of two seconds' exposure.

Many years ago, when working with wet plates only, it was discovered that "halation" might be avoided by placing back of the glass in the holder a sheet of *very* wet red blotting paper, which, adhering to the glass by reason of the moisture, to the exclusion of bubbles of air, would destroy the polish at the back of the plate and prevent reflection, for reason of the transparent medium being carried by the water intact to the absorbing surface of the paper. Then halation was thought to come from the light reflected back from the air in contact with the polished surface of the plate. Now I am told by Mr. Carbutt that he has seen as bad cases of halation with paper films, a fact I myself have not observed, and that halation may come from too thin a coating. Be this as it may, coating on the mat side has not prevented halation in my use of the celluloid films and I doubt if it would prevent halation if the mat side was made the back of the plate. If halation is sometimes caused by reflection, it is evident that the rough side will disperse light, not absorb it, and send it back over a wider surface.

I give this without experiment. With these dry plates we can try no experiments outside of those permitted by the makers. With wet collodion we might coat either side and try experiments, now we must take what the makers give us.

Reluctantly I have been obliged to admit that paper negatives lack in clearness in the distance, and I can see but one reason for this result. Every distance is made up of many microscopic pictures of each minute detail of that distance. As I sit at my cottage door and look over the Thames to the trees in the distance, I see masses of green but cannot distinguish the leaves of the trees. With a good field glass I can see more detail limited only by mist in the air. After making a celluloid negative of this same view and using a glass to examine it I find that I can see no minute detail on account of the coarseness of the surface upon which the negative has been made, the coating being on the "mat" side of the film.

If one desires to make a microscopic photograph such as can be enlarged by the microscopes into a perfect picture, he uses the finest glass for the purpose. Such a photograph would not be possible, I imagine, on paper or on ground glass or on the mat side of a celluloid film.

An artist painting such a view would disregard the minute detail and give in quiet color, merging into the tints of the sky, the masses of light and shade, and the delicate tints that the eye can see. He succeeds with his picture in proportion to the talent displayed in his handling of the colors and frame by disregarding detail. Our photographic lens cannot use the artist's discretion. It tries to give us all, and succeeds only when we place at its disposal a surface smooth enough to work on.

Some time ago I tried to make a picture of a house that was not to be obtained close by. I made a picture of it from a long distance and then tried to enlarge this minute speck of a house to the required size. The result was a picture seemingly out of focus for reason of the coarseness of the surface upon which the negative had been made. I had used paper and transferred to a gelatine film.

In correspondence with Mr. Carbutt on this subject I learn that all his recent celluloid films have been made either with the "mat" side on the back, or they have been on transparent films polished on both sides. The former have, he says, the advantage of taking the pencil for correction on the mat surface, and many of his customers like them, while the latter, the clear films, can be placed on either side in the holder to make the kind of negative desired. Thus, if with the film to the back the negative will be reversed and can be used in many of the processes now in use for reproduction.

So far as my experience goes the limit of use for paper negatives is for subjects where the distance is not of great moment and near objects alone are sought. No one took to paper films with more earnestness than the writer. Visiting England in 1886 two cameras were taken with me, one for glass plates and the other for the paper films, a roll-holder being attached to the one for paper. Both were detective cameras, and both were used continually. Of the more than three hundred pictures in the album of that trip, very few are from paper negatives. Some of the papers yielded good results, among these may be mentioned the big gun on Edinburgh Castle. A full set of views taken from the same Castle and sweeping the circle of the horizon were good for nothing, as lacking clearness.

Returning home and being still very much inclined to get all the good that could be obtained from the paper films, I adopted the stripping films and made many very good pictures and soon learned to strip with good results and absolute certainty. The attempts to enlarge from the stripped films were not satisfactory, but no good reason was thought of to account for the trouble.

Many very good pictures were obtained of subjects suited to the process, and the use of paper was continued until the advent of the celluloid films. Going south as far as Memphis, Tenn., the new celluloid films only were taken and many exposed. At Chattanooga, from Mission Ridge, all views showing a great expanse of distance were good for nothing, while all the subjects lacking the minute detail of distance were good. All the films used were made mat on one side and polished on the other, the coating being on the mat side. Having used up very many dozen of these celluloid films, I at last gave up all hope of using them for distant subjects, undecided why, until the idea came to me of the cause as already set forth.

Upon the advent of the celluloid plate I felt sure the problem of a light unbreakable plate was solved. The new film is or can be made as transparent as glass, and seemingly the surface is well polished. As Mr. Carbutt has given up coating on the mat side of the films, it is safe to infer that he has become satisfied that there is good reason to abandon the so doing.

Hoping to gain much in lightness by the adoption of the celluloid films, I made a case to carry five 6½ by 8½ holders with ten plates in place of three of the same with only six glass plates. The result has not been satisfactory, owing to the weight of the film carriers needed in addition to the films themselves. One can experience great gain in the diminished weight of the stock carried in the trunk while away from home, but the weight in the field is not so much less as was expected.

With a light unbreakable film, similar to glass in all respects save weight and brittleness, we can count on having what will give as good results provided the film can be made to lie flat in the holders. This result has not been obtained by me with the holders I have been able to obtain in the market. Some have come to me so crooked and buckeled as to be useless, and the other, flat of themselves, have failed to hold the films flat. In one case the slide of a holder resisting, when being drawn out it was found to come from the celluloid film having bulged out into contact with the slide, and then, from the action of the moist air of the sea-shore, had become glued to it. In other cases there have been lines seemingly indicative of the slide having scratched the film in going in or coming out. Celluloid films in rolls, would by the Eastman roll holder be held tightly extended, and perhaps will lie flat, but up to the time of this writing, such films on rolls have not been in the market, so far as I have been able to learn.

Mr. Carbutt has just sent me some celluloid films, some polished on the coated side, others with both sides polished.

One bright day since the receipt of the films coated on the polished side of the celluloid has given me a chance to expose a few, and these were the ones made with mat surface on the back, the sensitized coating on the polished side. As they were noted as 27 in quickness, I took exceeding care in placing them in the plate-holders, trusting more to the sense of feeling than sight for making no mistake in regard to the side exposed. In spite of this care, what I feared might happen came to pass with one plate, it had the mat side exposed, so but a feeble impression was made and the development was given up as hopeless. Had the film been polished on both sides the accident would have resulted in a reversed but good picture. As it is the result obtained, feeble as it is, can be utilized by working up with pencil on the mat side, which does take the lead very well.

To those who desire to work with pencil on the back of the negative the films coated on the smooth side with the mat surface on the back certainly have advantages over any other flexible film.

So far as I have been able to try the plates coated on the smooth side I can see no difference between them and negatives made on glass. The distance yields detail to the magnifying glass with as much certainty as the view itself does to the field glass. So far as I am now capable of judging the future of the celluloid films as a success is assured for work done away from home and where glass is too heavy. To the tourist the celluloid film is without doubt perfect, the only drawback being extra cost. Some subjects can be secured in a satisfactory way on paper, but all can be done as well on celluloid as on glass, with the advantage of decreased weight in stock to be carried and freedom from loss by breakage. The high price of the new plates will perhaps exclude them from the studios of the city photographers.

I hope my supposed reason for faulty distances in the use of paper negatives or with celluloid plates coated on the rough side will be thoroughly investigated by all interested, and that they will report their experience.

Coleman Sellers, E. D.

INTELLIGENT DEVELOPMENT.

Every amateur who really makes a scientific study of developing desires to know just how many grains of pyro, soda carb., potash carb., sodium sulphite, etc., he is using for A, B, or C's plates. In order to facilitate that calculation, I formulated the following from actual experiment. I took as my basis four fluid ounces of water, and dissolved in it one ounce (Troy) of each of the following chemicals; on carefully measuring the resultant bulk, I found:

One Troy ounce of soda carb. cryst. increased the bulk five fluid drams.

One Troy ounce potash carb. gran. increased the bulk three and one-sixth fluid drams.

One Troy ounce sodium sulphite cryst. increased the bulk four and two-thirds fluid drams.

One Troy ounce pyro (S. & A. Co's) increased the bulk four fluid drams.

Now as to the practical use of the above. Of course, where the plate-maker gives his formula for No. 1 and No. 2 solutions, and says, use sufficient quantity of water to make, say, sixteen fluid ounces when completed, it is very easy to find how many grains of each component are contained in each fluid ounce or fluid dram. But suppose he says, for instance, six ounces sulphite sodium crysts., one ounce pyro, sixteen ounces water. How many grains of sulphite and pyro are there in one ounce of this developer? From our table, one ounce sulphite increases the bulk four and two-thirds fluid drams, $6\times4\frac{2}{3}=28$ fluid drams; one ounce pyro increases the bulk four fluid drams, $28+4=32$ fluid drams = 4 fluid ounces; 16 ounces water + 4 fluid ounces increase = 20 fluid ounces.

On dividing the six ounces sulphite and one ounce pyro by twenty, we get 144 grains sulphite and 24 grains pyro to each ounce, or 16 grains sulphite and 3 grains pyro to each dram. Any other formula for either No. 1 or No. 2 can be worked out in the same way.

We can now work intelligently, and not merely by rule of thumb, using so many drams of No. 1 and No. 2 to so many ounces of water. Having worked out the formulæ of the various plate-makers, nail it up in your dark room. *Keep your pyro dry*, and your other chemicals in ten per cent. or twenty per cent. solutions, and with six stock-percentage-solutions you can in a moment combine the developer needed for any plate. In all my calculations I use Troy ounces (480 grains).

Wm. C. Stevenson, Jr.

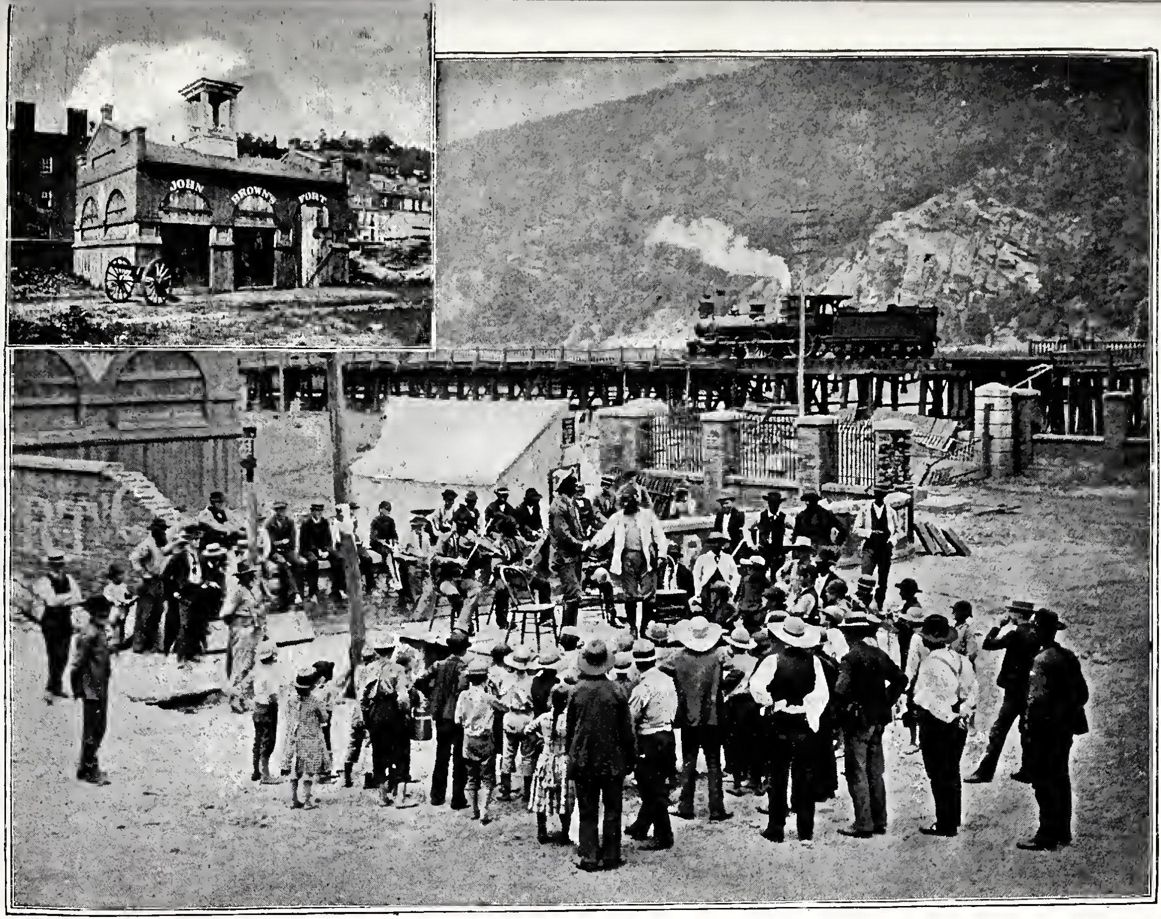
STROLLING MINSTRELS AT JOHN BROWN'S FORT.

The old town of Harper's Ferry derives its name, history tells us, from one Robert Harper, who bought a parcel of land there about 1747 from Lord Fairfax. and later on established a ferry.

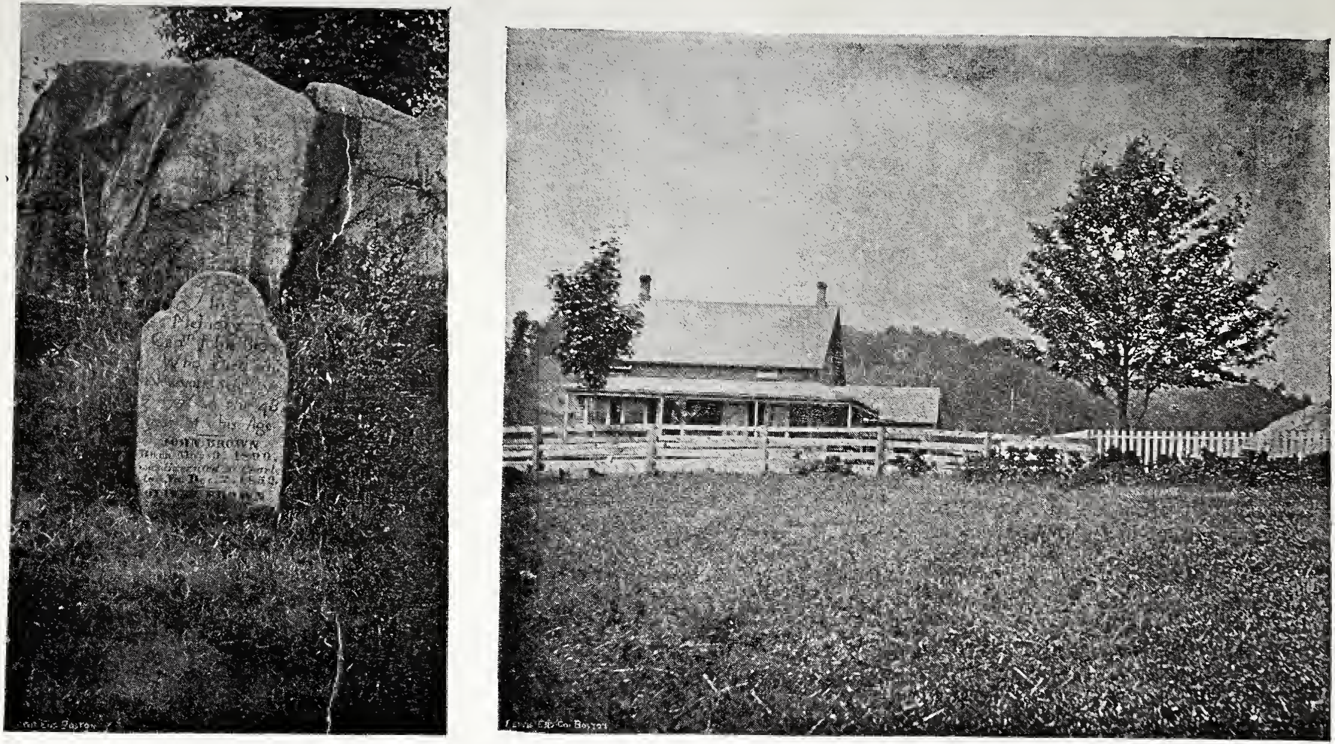
The town is situated at the junction of the Potomac and Shenandoah Rivers, which separate Maryland, Virginia and West Virginia. Opposite it, on one side of the Potomac, rises the Maryland Heights to an altitude of a thousand feet or more; across the Shenandoah are the Loudon Heights, and to get in or out of it you must cross a river or climb hills.

It is said that Gen. Washington seeing the military advantages of this place, established the National Armory, which stood there until the breaking out of the civil war.

The Armory *proper* was situated along the Potomac River, and about a mile from the town, on the Shenandoah, was the Rifle Factory. Before the war the population was mostly white, but as Harper's Ferry was the base of operations for both armies, and was sometimes held by the Northern and sometimes by the Southern forces, the inhabitants became scattered, and to-day there is a large proportion of indolent negroes to be found through the town. These remarks are intended for the readers who have not visited the place, that they may better understand the illustration.



Photographed by Geo. Norbury Appold. STROLLING MINSTRELS AT JOHN BROWN'S FORT. Photo. Engraving Co., N. Y.



4. Photographed by E. W. Newcomb.

GRAVE AND HOME OF JOHN BROWN.

Lewis Engraving Co. Boston.

During the year 1859 a party of men spent some time in the neighborhood of Harper's Ferry on the Maryland side, ostensibly for the purpose of looking for minerals, and this not being unusual, nothing was thought of their presence until on Sunday night, October 16, 1859, the watchman on the railroad bridge was taken prisoner by a party of about twenty-five armed men, who then proceeded to the Armory and captured the watchman there. They detailed a detachment to guard these two, and then went on making prisoners of many citizens and placing them in the Armory. About midnight the telegraph wires were cut and a train on the Baltimore and Ohio Railroad was " held up " for awhile, and some shots were exchanged without doing any damage.

A colored man went out on the bridge and on being ordered to halt started to retreat, but was fired on and mortally wounded. He was the first man killed.

As the workmen proceeded to the Armory in the morning, they were captured, and about 7 o'clock two citizens started out with shot-guns; they were fired on by guards at the gateway of the Armory, and one instantly killed.

Soon the excitement ran high and the citizens formed themselves into three companies, but, as John Brown's party had possession of the Arsenal, it was only by chance they were able to arm themselves from a supply that had recently been removed from the Armory.

The invading party at the rifle factory was all killed and John Brown, who remained at the Armory with another detachment of his men, with the prisoners, was prevented from escaping. Firing continued all day and a number on both sides were killed.

In the early part of the day John Brown, with what men he had left and some of the prominent citizens he had captured, retreated to the engine-house of the Armory and there barricaded the doors, thus making a fort which still goes by his name, but which is likely to be torn down in a few months.

The next morning (October 18th) Col. Robert E. Lee, afterwards the Commander-in-Chief of the Southern Army, with Lieutenant J. E. B. Stuart, afterward so famous as a general of a cavalry regiment in the same ranks, with a detachment of marines arrived from Washington. John Brown would not surrender, so the doors were battered down and he and his party were captured, but not until several of his men were killed. He was taken to Charlestown, tried, and hanged December 2, 1859. The rest of his party shared the same fate later.

The picture of the "Fort" shows it just as it appeared the day of the riot, except that the lower part has been covered with boards to prevent the many visitors from chipping away the bricks. The door on the extreme right must have been the one that was attacked, as it has been replaced by common boards, and the other two, which are constructed of two thicknesses of *heavy wood*, and covered with iron about half an inch thick, are just the same as when first erected. The engine house, or "Fort," as it is now called, is located a short distance to the left of the main gateway of the armory, so that it gave John Brown and his party a very commanding position.

The picture of "The Minstrel Party"* was taken instantaneously by the writer who happened to be waiting for a train, and as he was on the piazza of the hotel near by, the spectators grouped around the performers were not aware that they were being photographed. To the left will be seen a portion of John Brown's Fort; in the middle ground the trestle of the Baltimore and Ohio R. R. The background is Maryland Heights, and the spectators behind the impromptu stage are lounging around the front wall, where the once U. S. Armory stood. This wall was surmounted with a heavy iron railing, which was carried away by the flood of May 31, 1889.† A portion of the gateway can be seen to the right. The street is Shenandoah Street, and High Street is just one block away It was from this gateway that one of Brown's men fired and killed the first white man who was shot.

Harper's Ferry is well worth the attention of the tourist as, aside from the history of the place, the scenery in the neighborhood is grand and imposing, and the traveler can now find good accommodations at the hotel.

George Norbury Appold.

EXPERIENCES WITH BROMIDE ENLARGING.

Some time ago I commenced making portrait enlargements on "permanent bromide paper," with the view of becoming familiar with the photographic conditions of a perfect portrait lens. For this purpose I endeavored to produce a picture which would, in its pure photographic state, without retouching, as nearly as possible, resemble a cut or an engraving, and the numerous difficulties with which I was confronted and which I was at last successful in overcoming, seem of sufficient interest to warrant me in choosing my experiences herein as a subject to put before the readers of the ANNUAL in an article.

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*The Strolling Minstrels were genuine Southern negroes.

†During the flood of 1889 the water nearly covered the entire roof of John Brown's Fort.

I make my own negatives, 4x5 in size. The lens I use on my camera is a "Wide-Angle Orthoscope" No. II. After some experimenting with the different sized diaphragms, $\frac{f}{10}$ or $\frac{f}{15}$, according to light and subject, seemed to be most favorable. I also use the same lens for enlarging. I have made half, three-quarter, and especially life size enlargements, employing the usual apparatus.

One of my first disappointments was the unpleasant speckling in the face, which, although telling nothing but the truth, I desired and tried to prevent, or at least to moderate, and, to this end, I experimented making out-of-focus exposures. This method, however, was not entirely satisfactory, because it had to be carried a little too far in order to give the desired results.

I tried other diffusion methods, but with similar results. I then found that, although the speckling in the face of the portrait is a real reproduction of the imperfections in the face of the subject, it is, nevertheless, not a naturally perfect copy of the latter because incomplete in shading, thus producing an appearance of hardness, similar to that of microscopic objects when seen through an objective of low angular aperture, or of the moon scene through a small telescope. According to this discovery I resorted to the same means for remedy as I knew from my experiences with the microscope and the telescope, viz: Working with the largest possible *quantity* but moderate *intensity* of light. For this purpose I used for both the negative and the enlargement the largest aperture my lens will permit—which is $\frac{f}{5}$—together with the soft light of cloudy or rainy weather, and the resulting picture was just what I wanted. Even the lack of depth, resulting from the large aperture of the lens, produced the desired effect. If carefully focused to a favorable plane—the eye, or just a little behind it—there is only the proper degree of unsharpness in the picture, of the nearer and more remote parts of the subject, to produce an appearance of roundness and plasticity. Besides this the face presents a soft and natural appearance, showing every "detail" on its surface just as it appears on the original, and this is exactly, in my opinion, what is wanted. When I take a picture I do not wish it to flatter.

This being the present state of the optical part of my "art" of photographic portraiture, I by no means intend to content myself with it, but my next step toward improvement will be to substitute for my present lens one of longer focus in order to be enabled to use a still larger *angular aperture* without further reducing the "depth of focus" (the capacity of the "orthoscope" fortunately admits of such increase of aperture without loss in sharpness). Let me explain this: Suppose every factor in the production of the negative, viz., the lens and its focal length, the camera, the sensitive plate, the distances between the subject, the lens and the plate and even the subject, be twice as large as they are in my present case, then the resulting negative would be strictly analagous to an enlargement of my present one to double its size, representing the same degree of unsharpness of the respective parts, because everything is just doubled in measure. Now let the imaginary double sized subject be replaced by the original one while everything else remains unchanged, then the resulting negative will be equal in size to my present one, but with the unsharpness in the nearer and more remote parts reduced to just one half in the present negative, because the differences in distances of the respective parts of the subject from the lens are now just half what they would be with the imaginary double size subject. But for the reasons given I want just the degree of unsharpness which I get in my present negative and in order to produce it must correspondingly enlarge the aperture of the larger lens. My present is of ten inches equivalent focus, and its diaphragm is two inches in diameter $\frac{f}{5}$. Suppose now I want to substitute a lens of twenty inches equivalent for my present lens and increase the aperture only to $\frac{f}{4}$, the lens would then require a diaphragm of five inches diameter and the lenses themselves would have to be at least five and one-half inches diameter, which is certainly considerable and quite unusual for a 4x5 negative; but I believe I can use with advantage even a larger aperture than $\frac{}{4}$.

Having thus given my *optical* experiences, as far as I consider them of interest to the reader, it remains to mention the *chemical* which I encountered in the treatment of bromide paper, and which I have at last succeeded in overcoming.

With a few negatives on hand which, in my judgment, were about right in time of exposure and development, I commenced to produce some enlargements from them, following strictly and carefully all the directions for use given by the manufacturers with every package of paper, or in the text books, and my disappointment was great. The prints came out of the developer either with too much contrast, or, they presented a decided appearance of over-exposure, although the time taken was as short as possible. I at first attributed this failure to my lack of experience in negative making, and made new ones repeatedly after failing and failing again. I must say, however, that many of my first pictures were quite good enough for "finishing" in crayon, but this was not what I wanted; having determined to solve the problem, if possible, of producing large portraits which, *without retouching*, would have a finished and artistic appearance, for I believed in the new "bromide paper" as being destined to be the future material for the production of pure photographic pictures that resemble a work of art.

Having thus failed to secure the proper contrast in the picture by a properly exposed and developed negative, I directed my attention to the composition and condition of the developer, and, after considerable trouble discovered that the real or most marked action of the bromide, if added to the developer, is the production of *contrast.* Indeed, this peculiar capacity of the bromide is so great that from the same negative picture of almost any degree of contrast can be produced on bromide paper by a proportionate amount of bromide in the developer. Experimenting then with this important agent, I finally was successful in producing the most satisfactory prints with almost every kind of negative excepting only such of decided under-exposure. My method is as follows: Having the negative ready the first thing is to make trials on a small scale for the purpose of finding both the proper amount of bromide to be added to the developer, and the proper time of exposure to the paper. For this purpose I make contact prints on small pieces cut from the same paper, or taken from the same package, on which the large print is to be made. I introduce such a trial piece, together with the negative, into a small camera, expressly constructed for the purpose. The camera is provided with a small opening right opposite the negative and about eight inches distant from it. The hole can be varied in size by diaphragms ranging from $\frac{1}{8}$ to $\frac{1}{2}$ inch, and is closed by a shutter controlled from the outside. Each diaphragm corresponds to a certain size of the large print and the aperture of the lens, so that the same time of exposure as is found to be just right with the small camera will also be right for the large print.

According to the nature of the negative a certain time of exposure is allowed for the first trial, and a proportionate amount of bromide, accurately measured, is added to the developer. Then, if under these conditions the trial paper, on being developed shows, for instance, a lack of contrast, having a gray appearance, another trial is made with a little more bromide in the developer, and so on till the picture turns out just right. The time of exposure is at the same time so regulated as to be only just long enough for full development. When more bromide is to be used for normal contrast in the print, a longer time of exposure will be required.

The great importance of these preliminary trials and especially the determination of the exact percentage of bromide required in the developer, to secure a good print from a certain negative, will be readily understood from the fact that, from some negatives, I have obtained enlarged prints of normal contrast and beautiful artistic effect, in pure black and white, with an amount of bromide in the developer *exceeding that of the sulphate of iron solution.* (I use the exact solutions of bromide and iron and also of the oxalate as given in Eastman's formula), which is *over sixteen times* as much as is allowed by Mr. Eastman for a normal developer! And, indeed, the most careful predetermination of this ratio will be found to be the most essential condition of success in bromide enlarging, since negatives of apparently slight differences in regard to exposure and development may, in fact, give prints differing very widely in their respective contrasts, if the same amount of bromide is used for both.

When the proper ratio of bromide has been determined by preliminary trials it nevertheless may not unfrequently happen that the first enlargement turns out with a little abnormal contrast, and that, therefore, a second one will have to be made with the required correction of the percentage of bromide to be used, and much depends, in this respect, on the skill and experience of the operator.

In all cases where a large amount of bromide is required for normal contrast in the picture, I add to the developer a drop or so of sulphuric acid, according to the percentage of bromide in order to insure acidity of the developer.

I have had considerable trouble in securing pure black and white in my pictures, oftentimes getting a gray stain over the whole paper, at other times green prevailed; but the worst and most difficult, to me, was to avoid an ugly brownish tint in the half tones. I was often inclined to especially attribute this brownish tint to the great amount of bromide used. But careful experimenting convinced me finally that the bromide was not to blame for this nor any other kind of staining. It is the sulphate of iron that causes all the mischief. This solution must always be in the very best condition. At first I hoped to secure this by keeping up a bluish color of the fluid by occasionally adding a little tartaric acid to it and exposing it for three or four hours to direct sunlight, and only when the color persistently returned to yellowish green was the solution rejected. But this treatment as well as several others proved to be unreliable, and only since have I adopted the plan of using fresh solution every day, or for every batch of pictures, have I, without exception, obtained a pure black, and not a single picture was spoiled since.

I dilute my developer with an equal quantity of water, in order to retard its action, whereby I am enabled to prevent over-developing with certainty, and have never experienced any bad effects by this method. In exceptional cases I was compelled to vary the quantity of water to double or half the amount, according to the quality of the negative.

I always reduce the time of exposure to a minimum, so as to be just sufficient to allow with certainty the full development. I have found the precaution to be of great benefit to the quality of the picture.

My ruby light is so arranged that it can be instantly and with ease so strengthened that every detail of the picture is distinctly visible. This light I turn on at the moment when the picture appears to be nearly full developed, while from the beginning until that moment I use the weakest light possible.

For my clearing solution I do not use acetic acid, but *oxalic* acid instead, the first and second washing being with a strong solution—one ounce to a pint of water—the third half an ounce to a pint, and the fourth pure water. The oxalic acid secures a perfect whiteness of the paper, which I could with the acetic acid obtain only occasionally.

I use Eastman's hypo solution, in which I immerse the picture fifteen minutes, after which I wash it for three hours in pure water.

I found the dampness of my cellar useful for *slowly* drying the picture, by which method I prevent too much and uneven shrinking of the paper.

I do not hang the picture for drying, but place it on a white canvas stretched horizontally in the air.

I have found that, since having been able to produce, with certainty, a portrait with normal contrast, I can, without trouble, print on bromide paper, landscapes and other kinds of pictures with normal contrast and beautiful effect, from *any* kind of negatives, if not too far away from normal exposure and development, while, I believe, I never would have been able to do this if I had not previously learned to make portraits. It is much easier to make any other kind of bromide prints than portraits. *Ernst Gundlach.*

THE USE OF PHOTOGRAPHY AS AN AID IN DETERMINING THE STRUCTURE OF VERY MINUTE OBJECTS.

The microscopist studying very minute forms of life is frequently puzzled to determine the real structure of the specimen before him, and in many such cases photography, when properly applied, will assist greatly in arriving at the final conclusion.

In illustration of this general proposition the accompanying plate of photographs of the test diatom *Pleurosigma angulatum* has been prepared, as being possibly of interest to such readers of the Photographic Times Annual as are interested in the application of photography to microscopy.

A photograph of the diatom at a magnification of 900 diameters, shows well the beaded appearance ordinarily exhibited under a good objective, which is still quite generally considered to be the real structure of the frustule. I say quite generally, because, while this appearance has been known to advanced microscopists for several years to be entirely deceptive, the greater number of those using the tube, in this country at any rate, still consider the beaded appearance as being the real structure of the diatom.

Fig. 1 is at 1650 diameters magnification, and apparently shows still more clearly the beaded structure. Fig. 2, however, also at 1650 diameters shows an entirely different structure. Fig. 1 is a print from a *negative,* while Fig. 2 is a print from a *positive* made from Fig. 1. The reversal of the lights and shadows so obtained gives us in Fig. 2 the real structure of the diatom. It is clearly seen from this figure that the frustule, instead of being a flat surface studded with hemispherical beads, regularly arranged in rows, is in reality a network with hexagonal openings. That this is true may be easily shown by certain simple experiments in optics, from which it has been determined that these minute openings act as gratings decomposing light into its elementary vibrations exactly as is done by the fine rulings known as diffraction gratings.

By reason of the universal use of *Pleurosigma angulatum* for test purposes, there is probably no object so well known to all persons concerned in the use of the tube as this one, and to

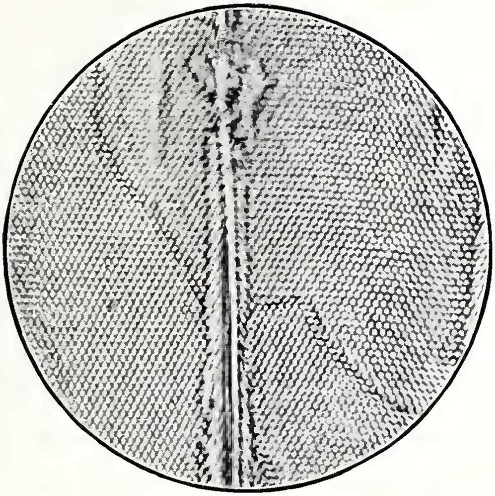

FIG. 1.

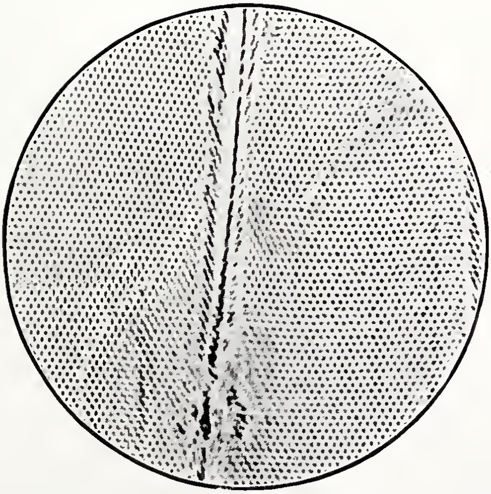

FIG. 2.

some such, at any rate, it may be of interest to learn that the very best objectives give in a positive print faint points of light between the large hemispherical dots. These may be seen in a portion of Fig. 1 with a good magnifying glass, but to exhibit them clearly the magnification should be at least double that of Fig. 1. Zeiss, in his recent large photo-micrographic catalogue, gives a photograph of *Pleurosigma* at 4900 diameters, in which this appearance is clearly seen, and the bringing out of these secondary dots is now considered the most difficult test to which high-power objectives can be subjected.

It may be noted as further matter of interest that not every minute object will yield the whole secret of its structure to our best photographic manipulation. In illustration I may cite the case of another test object the *Amphipleura pellucida.* The markings on this diatom are so fine that a linear inch of space will contain from 92,000 to 108,000 of them and this fact was determined photographically by Dr. Woodward a number of years ago. Reasoning from analogy it has been inferred that the transverse striæ, which have thus far been clearly photographed, and which are the usual appearance under a good resolution of our modern objectives, are not the whole structure, but that in reality this diatom has a beaded structure and probably a net-work similar or analogous to that exhibited by Fig. 3, but all attempts to show such structure have thus far failed. A number of enthusiastic photo-micrographers have indeed claimed to have succeeded, but an examination of their photographs uniformly shows that the personal bias has led to the mistaking of defraction lines for real structure. This criticism applies to all the photographs of *Amphipleura* resolved into beads that I have yet seen. Indeed, it appears to be perfectly evident, that before this problem can be settled we need to develop either some new photographic technique, or else a method of constructing objectives of a numerical aperture of at least 2.0. A discussion of this point will, however, lead us too far away from our subject, and I therefore leave the matter here for the further consideration of such photo-micrographers as delight in difficult resolutions.

Fig. 1 was made with a Zeiss apochromatic of 2 m.m. focal length and 1.30 numerical aperture and the amplifier. Sunlight.

Geo. W. Rafter.

LITHO-HELIO-GRAVURE.

Recently I have had an opportunity to see in the offices of the Dutch General-staff at the Hague, a peculiar method of lithography, upon which is based a process of litho-helio-gravure, invented by Director Charles Eckstein. With it half-tone reproductions from original photographs are printed in monochrome, or if it desired in color by one process of printing.

A very carefully and accurately made line or ruled stone is the basis of the method. In the first place a lithographic stone of superior quality is polished with oxalic acid and water, and then coated uniformly with a very thin asphaltum solution, composed of five parts asphaltum, six parts of white wax, and six parts of stearic acid to which, while boiling, is added two parts of soda solution. This tolerably hard compound is then dissolved in spirits of turpentine, filtered, and kept in well stoppered bottles. By pouring a sufficient amount of the solution upon the center of the stone and by distributing it evenly all over by means of a lithographic ink roller, a very thin film of light-brown color is produced. With the ruling machine and the very fine point of a diamond very fine parallel lines are then so closely drawn over the whole surface that the stone's surface will apparently present one single tone. Eight of these lines occupy the space of one millimeter. A border of wax ½ cm. in height is then fastened around the edges of the stone, preparatory to etching. To do so the stone is placed in a tray of sufficient dimensions, set horizontally with the aid of a spirit level and fastened down with screws. The first etching solution, previously prepared, consists of 0.10 parts of chemically pure nitric acid, 6 parts of 36 deg. alcohol, and 35 parts of distilled water. It must be poured over the stone with one sweep and allowed to act for just one-half of a minute, after which the stone is washed rapidly, dried, oiled, and the asphaltum washed away with spirits of turpentine. The stone, when rolled in with color, is then ready for making transfers and forms the so-called mother-stone (*Mutter Raster-stein.*)

Transfers can now be made, according as the character of the original photograph to be reproduced may demand, either in parallel lines direct from the original stone, or by repeated transfering and crossing of the original lines, once, twice, three or four times. The latter produces a star-like grain, well adapted for litho-helio-gravure work. To transfer the line-work a well polished stone is prepared with asphaltum solution and work continued in the following manner : In the first place a print of the mother-stone must be made upon transfer paper, then slightly moistened on its reverse side, squeegeed upon the surface of the polished stone, and when partly dry, be subjected to the action of warm water, when the paper will come off and leave the line transfer upon the plate. After washing well with water, a second transfer, with its lines crossing those of the first in right angles can then be made, forming thus the so-called hatching of lines, or the manipulation be repeated, each additional transfer crossing the lines of the first in more or less acute angles. Finally the transfer is dusted in with fine Collophonium powder, any surplus of it removed with a camel's hair brush, and the Collophonium melted on to the transfer with ether.

The next step in producing a litho-heliogravure is to make from a clear and well-defined photographic negative a diapositive on pigment paper, sensitized with potassium bichromate, and with an exposure to light of from ten to thirty minutes. The positive print is then slightly moistened with cold water, and with the pigment side down squeegeed upon the lined stone; then in a suitable trough treated with warm water, of from 40 to 45 deg. C., when after the expiration of about five minutes the paper begins to loosen, and can then be lifted off. By constantly rocking the stone, and allowing warm water to run over it to and fro the carbon print develops, and stands out clear and bright. It is a negative copy. The stone must then be dried spontaneously with great care, which requires from five to six hours, at the expiration of which time it is ready for etching.

The etching fluid is ferric chloride of different concentration, 40, 37, 33 and 30 deg. Beaumé, respectively. Etching is commenced with the 40 deg. solution. The ferric chloride attacks first the portions of the thin but hard pigment film still remaining, dissolves it, and finds way to the openings between the lines, eats into the stone and produces the deepest parts of the gravure. The action upon the thicker portions of the pigment film is slower, but that also yields, and the etching continues for awhile, but with less force and rapidity.

Practice and a well educated eye determines when, and in what succession the etching fluid in different strengths should be employed. The 30 deg. solution, naturally, is used last of all, and the large amount of water is capable of dissolving the whole of the pigment film still remaining. As soon as the required depth of etching and the desired character is attained, the stone is removed to a trough and thoroughly washed under a spray of water. The surface is then flowed with spirits of turpentine to wash away the asphaltum, washed again in water several times, and dried finally either in the sun or by the ordinary temperature of a room. The lines are now deeply etched on the stone.

The etching is then oiled, inked, and treated otherwise as required by litho-gravure methods. If it is desired to print from a helio-graphic stone proofs in more than one color, the whole of it is first tamponed with a local or general tone, gray, violet, or brown, as the character of the picture may demand, and by marking out the respective portions of its single colors tamponed upon the ground tone. A very slight touch with a tampon will deposit a sufficient amount of pigment. If all the different colors have been applied, a print can at once be made.

The results are really very fine, and the color effect is astonishing.

Herr Director Eckstein exhibited such prints in Paris, and earned universal approbation and the acknowledgements of connoisseurs.

Ottomar Volkmer.

STANDARD FORMULÆ AND USEFUL RECIPES.

Arranged by Charles Ehrmann.

THE WET COLLODION PROCESS.

1.—Negative Collodion.

Ether	½ ounce
Absolute alcohol	½ ounce
Pyroxyline	5 grains
Iodide ammonium	5 grains
Bromide of cadmium	2 grains

2.—Negative Collodion.

Plain Collodion		*Sensitizer.*	
Alcohol	5 ounces	Alcohol	5 ounces
Ether	10 ounces	Iodide ammonium	60 grains
Pyroxyline	100 grains	Iodide cadmium	30 grains
		Bromide cadmium	20 grains

After being perfectly dissolved, mix.

3.—Ferrotype Collodion (Estabrooke's).

Iodide of ammonium	30 grains
Iodide of sodium	10 grains
Iodide of cadmium	20 grains
Bromide of cadmium	20 grains
Ether and alcohol (of each)	5 ounces

Pyroxyline, sufficient quantity, say 25 grains.

4.—Collodion for the Reproduction of Line Work (Volkmer's).

Plain Collodion.		*Sensitizer.*	
Ether	500 grams	Chloride of calcium	1.6 grams
Alcohol	400 grams	Iodide ammonium	4.7 grams
Pyroxyline	16 grams	Iodide cadmium	7.8 grams
		Absolute alcohol	100.0 grams

After being perfectly dissolved, mix.

5.—Silver Bath for Wet-Plates.

Nitrate of silver	1 ounce
Distilled water	10 ounces

Iodize and acidulate with nitric acid.

6.—Silver Bath for Wet-Plates (Liesegang's).

Distilled water	150 c.c.m.
Nitrate of silver	10 grams

If the bath fogs add a few drops of iodine solution (1 part iodine to 10 parts alcohol).

7.—Silver Bath for Line Work.

Water	1 litre
Nitrate of silver	100 grams

Nitric acid, c. p., a few minims, to acid reaction.

To 1 litre of bath add 20 c.c.m. of the following solution:

Iodide potassium	6 grams
Iodine	1 gram
Water	500 c.c.m.

8.—Silver Bath for Ferrotypes (Estabrooke's).

Water	64 ounces
Nitrate of silver	4 ounces
Iodide potassium	2 grains

Dissolve, sun for three or four hours, filter and acidulate.

9.—Developer for Ferrotypes, by E. P. Griswold.

Water	64 ounces
Protosulphate of iron and ammonia	4 ounces
Acetic acid, No. 8	4 ounces
Yellow rock candy	½ ounce

10.—Developer for Wet-Plates.

Sulphate of iron and ammonia	1 ounce
Acetic acid	1½ ounce
Water	16 ounces

11.—Developer for Hard Negatives (Line Work), Wet-Plates.

Water	100 c c.m.
Protosulphate of iron	5 grams
Tartaric acid	1 gram

12.—Developer for Wet-Plates (Very Intense).

Water	1000 c.c.m.
Protosulphate of iron	36 grams
Sulphate of copper	12 grams
Glacial acetic acid	50 c.c.m.
Alcohol	40 c.c.m.

13.—Developer for Wet-Plates.

Protosulphate of iron	1 ounce
Acetic acid	1 ounce
Water	16 ounces

14.—Intensifier for Wet-Plates.

Saturated solution of protosulphate of iron	20 c.c.m.
Acetic acid	10 c.c.m.
Citric acid	5 grams
Water	200 grams

And silver solution to suit.

15.—Intensifier for Wet-Plates.

Pyrogallic acid	1 gram
Citric acid	3 grams
Water	80 c.c.m.

And silver solution to suit.

16.—Intensifier for Line Work, Wet-Plates.

A.—Bromide of potassium	¼ ounce
Water	4 ounces
B.—Sulphate of copper	½ ounce
Water	4 ounces

Mix equal parts of A and B and pour on the film. When perfectly whitened, blacken with solution of nitrate of silver, 30 grains to the ounce.

For greater intensity, use hydrosulphate of ammonia solution, 1 part in 4 parts of water, after the bromide of copper, and thorough washing.

17.—Intensifier for Wet-Plates.

Red prussiate of potash	2 drams
Nitrate of lead	3 drams
Water	12 ounces

Immerse the fixed negative till thoroughly whitened; wash, and flood with solution of hydrosulphate of ammonia (see No. 19).

18.—Intensifier for Wet-Plates.

Water	1 litre
Red prussiate of potash	50 grams
Nitrate of uranium	50 grams
Sugar	50 grams
Sulphuric acid	30 minims

19.—To Strip Collodion Negatives.

The best way to do this is to coat the negative, when dry, with a solution of pure rubber in benzole, and afterwards with leather collodion. When perfectly dry, the edges of the negatives may be cut in, and the plate immersed in a diluted acetic acid solution 1:10. After a short time the film loosens, and may easily be detached from the plate, and turned.

20.—To Rectify a Negative Silverbath.

Dissolve one part of permanganate of potassium in hundred parts of water and add drop by drop so much of this solution to the bath impregnated with organic matter, till after vigorously shaking a slight pinkish color remains.

Sun for several hours, filter and test for neutrality. Acidify with nitric acid.

DRY COLLODION PROCESSES.

21.—Collodio-Bromide Emulsion.

Ether, sp. g.: .720	5 fluid ozs
Alcohol, sp. g.: 820	3 fluid ozs
Pyroxyline	50 grains
Bromide of cadmium and ammonium	80 grains
(or bromide of zinc	76 grains)

Sensitize by adding to each ounce 15 grains of nitrate of silver, dissolved in a few drops of water and one dram of boiling alcohol. This is suitable for slow landscape work or transparencies.

22.—Washed Emulsion.

Ether, sp. g. .720	4 fluid ozs
Alcohol, sp. g. .820	2¾ fluid ozs
Pyroxyline	40 grains
Castile soap dissolved in alcohol	30 grains
Bromide of ammon. and cadmium	84 grains

Sensitize with 100 grains of nitrate of silver dissolved in 1 ounce of boiling alcohol, and after standing ten days, add 20 grains more of silver, dissolved in 2 drams of alcohol.

For greater rapidity, use ¼ oz. more alcohol, and add at first only 54 grains of the double bromide of ammonium and cadmium; sensitize with 125 grains of nitrate of silver, dissolved as before in one ounce of boiling alcohol. In twelve hours' time add 30 grains more of the double bromide of ammonium and cadmium, dissolved in half an ounce of alcohol, and wash.

23.—Washed Emulsion for Transparencies.

Ether, sp. g. .720	5 fluid ounces
Alcohol, sp. g. .820	3 fluid ounces
Pyroxyline	60 grains
Bromide of cadmium and ammonium	100 grains
(or bromide of zinc	90 grains)
Hydrochloric acid, sp. g. 1.2	8 minims

Sensitize with 20 grains of nitrate of silver to the ounce, dissolved in a minimum of water with 2 drams of boiling alcohol. Allow to stand for two or three days.

The emulsion, after being allowed to ripen, should be poured into a dish and set aside to become thoroughly dry. The mass of dry emulsion is then washed, to remove all soluble salts, and is then again dried and re-dissolved in equal parts of ether and alcohol, at the rate of from 20 to 24 grains to the ounce of the solvents.

24.—Developer for Collodion Emulsion.

A.—Pyrogallol	96 grains
Alcohol	1 fluid ounce
B.—Bromide of potassium	10 grains
Water	1 fluid ounce
C.—Liquor ammonia, sp. g. .880	1 fluid dram
Water	15 fluid drams
or,	
D.—Carbonate of ammonium	2 grains
Water	1 fluid ounce

For each dram of developer take for a normal exposure 5 minims of A, 1 or 2 minims of B, and 1 or 2 minims of C, or if D be used, add the above quantities of A, B and C to 1 dram of D. When the details of the image are out, add double the quantity of B and C.

25.—Intensifier for Collodion Emulsion Negatives.

Nitrate of silver	60 grains
Citric acid	30 grains
Nitric acid	30 minims
Water	2 ounces

To each dram of a solution of pyrogallol, three grains to the ounce, add 2 or 3 minims of the above, and apply until sufficient density is secured.

ALBUMEN PROCESSES.

26.—Gobert's Albumen Process.

Albumen from fresh eggs	26 drams
Iodide of ammonium	15 grains
Bromide of potassium	4 grains
Iodine in pellets	4 grains

Sensitize in

Distilled water	4 ounces
Nitrate of silver	155 grains
Glacial acetic acid	2½ drams

Albumen plates are developed with saturated solution of gallic acid with a few drops of aceto-nitrate of silver solution (1 to 30).

27.—Whipple & Black's Albumen Honey Process.

Albumen	8 ounces
Honey	7 ounces
Iodide of potassium	3 drams
Bromide of potassium	20 grains
Chloride of sodium	10 grains
Water	2 ounces

Sensitize in bath of the following proportions—

Nitrate of silver	1 ounce
Water	10 ounces
Acetic acid	8 to 10 drams

For development, see above (No. 26).

GELATINE DRY-PLATE PROCESSES.

28.—W. K. Burton's Gelatine Emulsion.

A.—Bromide of ammonium	260 grains
Iodide of potassium	20 grains
Gelatine (Nelson, No. 1)	80 grains
Distilled water	10 ounces
B.—Silver nitrate (dry)	200 grains
C.—Silver nitrate	200 grains
Distilled water	1 ounce

Converted to ammonia-nitrate.

D.—Gelatine, hard (dry)	600 grains

For detailed directions for making the emulsion, see Photographic Times, Vol. XVII, page 285.

29.—Burbank's Gelatine Emulsion.

Water	1 ounce
Bromide of ammonium	15 to 20 grains
or,	
Bromide of potassium	18 to 25 grains
Nitrate of silver, proportioned to the amount of bromide	25 to 30 grains
Gelatine	30 to 40 grains

See Burbank's "The Photographic Negative," pages 87–109.

30.—Henderson's Gelatine Emulsion by Ammonia Method.

In distilled water	8½ ounces
dissolve	
Bromide of ammonium	308 grains
Gelatine (previously swelled)	50 grains
When cold add	
Water	1¾ ounces
Alcohol	1¾ ounces
Stronger ammonia	½ ounce
In distilled water	3½ ounces
dissolve by heat	
Nitrate of silver	462 grains

and add gradually to the gelatine solution. Ripening for twenty-four hours gives sensitiveness to the emulsion. Add, finally, 220 grains of swelled gelatine.

31.—George W. Fowler's Gelatine Emulsion.

A.—Bromide of potassium	84 grains
Iodide of potassium	4 grains
Muriatic acid	1 drop
Gelatine	36 grains
Distilled water	4 ounces
B.—Nitrate silver	108 grains
Distilled water	2 ounces
C.—Gelatine (hard)	100 grains

Water to cover, used merely to soften the gelatine.

32.—Dr. J. M. Eder's Gelatine Emulsion with Ammonio-Nitrate of Silver.

In distilled water, 4 ounces, dissolve bromide of potassium, 310 grains; add gelatine, 617 grains, previously swelled in water. In distilled water, 4 ounces, dissolve nitrate of silver, 462 grains.

To this solution, cold, add stronger ammonia, drop by drop, until the precipitate first formed is re-dissolved. Add this gradually to the first solution, and place in a water bath at a temperature of 105 deg. Fahr., for 30 to 45 minutes. Then remove the source of heat, and allow the emulsion to cool down gradually to about 75 deg. Fahr., then pour out to set, and proceed as usual.

DEVELOPING FORMULÆ FOR GELATINE DRY-PLATES.

33.—Soda-Potash Developer for Gelatine Dry-Plates.—J. Carbutt.

A.—Distilled or ice water	10 ounces
Sulphite of soda crystals	4 ounces

Dissolve and add slowly

Sulphuric acid	1 dram
Pyrogallol	1 ounce
Water to make up to 16 fluid ounces.	
B.—Water	10 ounces
Carbon. of potass., ch. pure	2 ounces
Carbon. of soda, granulated	2 ounces

N. B.—During summer add thirty grains of bromide of potassium to A; for portraits or instantaneous work, to four ounces of water add three drams of A and two drams of B. More of B to be added if under-exposed, and more of A, with a few drops of a 10 per cent. solution of bromide of potassium, if over-exposed.

34.—CARBUTT'S IMPROVED DEVELOPER FOR TRANSPARENCIES.

A.	Oxalate of potash	8 ounces
	Water	30 ounces
	Citric acid	60 grains
	Citrate of ammonia solution	2 ounces
B.	Sulphate of iron	4 ounces
	Water	32 ounces
	Sulphuric acid	16 drops
C.	Citrate of ammonia solution.	

Dissolve one ounce citric acid in five ounces distilled water, add liquor ammonia until a slip of litmus paper just loses the red color, then add water to make the whole measure eight ounces.

Developer.—Add one ounce of B to two of A, and one-half ounce of water, and three to six drops of bromide solution.

Let the development continue until the blacks look quite strong, and detail plainly showing in the high lights; wash off developer thoroughly before fixing, use fresh hypo solution, when fully cleared, wash for half hour, then immerse five minutes in the hardening solution given below; afterwards wash for half hour, then carefully go over surface with soft camel's-hair brush, or pledget of cotton, to remove any particles of dirt; place in rack to dry. Then varnish with plain collodion:

Collodion Varnish.

Alcohol	4 ounces
Pyroxyline	30 to 40 grains
Sulphuric ether	4 ounces

When, after shaking, the cotton is dissolved, filter and flow the plain collodion over the dry transparency, the same as when using varnish; when dry, cover with matt and a crystal cover glass, and bind with binding strip.

Hardening and Clearing Solution.

Water	36 ounces
Chrome alum	½ ounce
Citric acid	¼ ounce

Three to five minutes, then wash and place in the

Fixing Solution.

Hyposulphite of soda	8 ounces
Water	40 ounces

35.—SODA DEVELOPER FOR GELATINE DRY-PLATES (CARBUTT'S "ECLIPSE" FORMULA).

No. 1 Pyro Stock Solution.

A.	Distilled or ice-water	10 ounces
	Sulphuric acid	1 dram
	Sulphite of soda crystals	4 ounces

Then add Schering's pyro, one ounce, and water to make sixteen fluid ounces.

No. 2 Stock Soda Solution.

B.	Water	10 ounces
	Sulphite of soda crystals	2 ounces
	Carbonate of soda crystals (or dry granular, one ounce)	2 ounces
	Potash carbonate	1 ounce

Dissolve and add water to make measure sixteen fluid ounces.

For large galleries, dilute with water to proportion of ten ounces of No. 2 to seventy ounces of water to make eighty fluid ounces for winter use, testing 5 deg. Beaumé, and to 100 to 120 fluid ounces for summer testing 3½ deg. to 4 deg. Beaumé and label "Dilute Soda Solution."

No. 3 Bromide Solution.

C.—Bromide of sodium or potassium	½ ounce
Water	5 ounces

Developer.—Dilute sufficient of B to meet the requirement for the day's work, or the number of plates to be developed, by adding eight ounces of water to two ounces of stock B. To three ounces of dilute B, add 1½ to 2½ drams of A. The more pyro the denser the negative, and *vice versa.* One and one-half dram A to above quantity of B dilute, has been found to yield portrait negatives of perfect quality and quick printers. If restraining becomes necessary, use a few drops of No. 3. No yellowing or fogging need be apprehended, if directions are followed. After developing, wash and immerse negatives in the

Hardening and Clearing Bath.

Chrome alum	½ ounce
Citric acid	¼ ounce
Water	36 ounces

for not less than two minutes, wash under tap and place in

Fixing-Bath.

Hyposulphite of soda	8 ounces
Water	40 ounces

The weight used in this formula is the avoirdupois ounce of 437½ grains.

36.—MANIPULATION OF CARBUTT'S FLEXIBLE FILMS.

First lay film in water in tray for half a minute or so, then develop, fix, and wash precisely as for glass dry plates; after washing, lay for five minutes in water 25 ounces, glycerine 1 ounce, pass rapidly through clear water, then hang up by spring clip to dry.

37.—FORMULÆ AND DIRECTIONS FOR WORKING THE CRAMER PLATE OF HIGH SENSITIVENESS.

Alkaline Solution.

Sulphite of sodium crystals	6 ounces
Carbonate of sodium crystals (sal soda)	1½ ounces
Water	64 ounces

The alkaline solution, as well as the sulphite of sodium, must be kept in well-stoppered bottles. If old and decomposed it will cause yellow stains.

If dried or granular sulphite of sodium is used, 3 ounces will be found equal to 6 ounces crystals.

Twelve drams carbonate of sodium crystals (sal soda) are equivalent to 5 drams carbonate of sodium dried or 6 drams carbonate of potassium.

Pyro Solution.

Distilled or pure ice-water	6 ounces
Sulphuric acid	15 minims
Sulphite of sodium crystals	1 dram

After this is dissolved add

Pyrogallic acid	1 ounce

The solution should have a bright yellow color and smell like burning sulphur, owing to the liberation of sulphurous acid, which preserves the pyro.

Developer.—During cold weather use 8 ounces alkaline solution and 2 to 5 drams pyro solution; keep moderately warm (about 70 degrees Fahrenheit).

In hot weather add to 4 ounces alkaline solution, 6 ounces cold water and from 2 to 4 drams pyro solution, and keep it cool (below 60 degrees Fahrenheit).

Developer which is too warm or contains too much carbonate of soda or potassium will work foggy.

Three drams pyro solution will generally be found sufficient for 8 ounces developer to produce good intensity if the plates are not over-exposed and if the development is carried on far enough.

The developer can be used repeatedly.

When fresh it answers best for short exposures.

After having been used once or twice it will work with more contrast and clearness. Therefore it is well to add a little old developer to the new. For over-exposed plates old developer should be used, and if much over-exposed, restrain by adding to the developer a few drops of bromide solution (1 ounce bromide of potassium to 10 ounces of water).

An under-exposed plate should be treated with diluted developer, weak in pyro, for instance: 4 ounces alkaline solution, 1 dram pyro solution and 8 ounces of water; use plenty of solution, keep it cool and change it several times if the exposure has been so short as to require prolonged development.

Fixing Bath.

Hyposulphite of soda	1 pound
Water	1 gallon

Do not expose the plate to light before it is fixed, and leave it in the bath a few minutes longer than apparently necessary, to insure thorough fixing.

To prevent yellow staining of negatives it is of the utmost importance to renew the hypo bath as soon as the solution turns dark.

After fixing place the negative in dish containing cold alum solution. Let it remain about fifteen minutes to harden the film, then wash thoroughly.

In hot weather, when there is danger of frilling or softening of the film, use the following:

Fixing Bath for Hot Weather.

Dissolve

Hyposulphite of soda	2 pounds
Bicarbonate of soda	½ pound
Powdered alum	2 pounds

in 2 gallons of water.

Allow to stand a couple of days until settled, then decant the clear solution for use. This bath will fix somewhat slower than the plain hypo bath, but will produce very clear negatives and will harden the film so thoroughly as to allow subsequent washing without the use of ice. It should be used in tropical climates.

38.—POTASH DEVELOPER FOR GELATINE DRY-PLATES (BEACH'S FORMULA).

A.—*Pyro Solution.*

Warm distilled water	2 ounces
Sulphite of soda	2 ounces

Dissolve, and when cold add

Sulphurous acid	2 ounces
Pyrogallol	½ ounce

B.—*Potash Solution.*

1.—	Water	4 ounces
	Carbonate potash, c. p.	3 ounces
2.—	Water	3 ounces
	Sulphite soda	2 ounces

Combine 1 and 2 into one solution.

For a shutter exposure take three ounces water, half ounce A, and three drams B, increasing the latter to five drams if the image hangs back

For over-exposure, three ounces water, three drams A, one dram B, adding more if necessary.

39.—POTASH DEVELOPER FOR GELATINE DRY-PLATES (DR. STOLZE'S).

Modified bv Dr. Eder.

A.—Water	200 c.c.m.
Carbon of potass, c. p.	90 grams
Sulphite of soda	25 grams
B.—Water	100 c.c.m.
Sulphite of soda	25 grams
Pyrogallol	12 grams

Mix 40 minims of A with 50 minims of B and 100 c.c.m. of water.

Bromide of potassium should be used only in minimal quantities, one to three minims (of a ten per cent. solution); with more, the general sensitiveness is much reduced.

An alum bath mixed with an equal volume of saturated sulphate of iron solution increases the density, and gives the plate a good printing quality.

40.—DEVELOPER WITH SULPHITE OF AMMONIUM, FOR GELATINE DRY-PLATES.

A.—Water	350 c.c.m.
Sulphite of ammon	70 grams
Pyrogallol	25 grams
B.—Water	250 c.c.m.
Bromide of ammon	8 grams
Ammonia	80 c.c.m.

Take 1 c.c.m. of each and 35 c.c.m. of water.

41.—POTASH DEVELOPER FOR "HARVARD" DRY-PLATES.

A.—Distilled water	12 ounces
Sulphite of soda (crystals)	2 ounces
Citric acid	60 grains
Bromide of ammonium	25 grains
Pyrogallic acid	1 ounce

Dissolve separately, mix in order named and filter.

B.—Distilled water	12 ounces
Sulphite of soda (crystals)	2 ounces
Carbonate of potash	4 ounces

Dissolve separately, mix and filter.

The stock solutions must be kept in well stoppered bottles, The pyro stock solution will remain clear and in good order for about a month. It should not be used after it has turned dark and muddy from age.

To develop, mix A, one dram; B, one dram; water, two ounces. For detail, add more water; for contrast, more A; for density, more of each A and B. For instantaneous or short exposures use double the quantity of water (4 oz.) to begin with, pour off when about half developed and finish with developer, full strength.

After development, and before fixing, it is well to flow the negative with a saturate solution of alum. Rinse, and fix in the following solution:

Hyposulphite of soda	1 pound
Water	2 quarts

Many prefer to add alum to the fixing solution (about one ounce to the above), to which there is no serious objection, provided, always, it is filtered occasionally.

42.—Developer for Ivory Films.

Soda Developer.

Stock Solution.

Water	10 ounces
Sulphite Soda (Crystals)	2 ounces
Sal Soda (Crystals)	2 ounces
Bromide Potassium	30 grains

For use add to 5 ounces water, 1 ounce stock solution, 12 grains pyrogallic acid.

Ammonia Developer.

Stock Solution.

Water	4 ounces
Sulphite Soda	180 grains
Bromide potassium	180 grains
Liquor Ammonia (.880)	5 drams

For use add to 6 ounces water, 1 dram stock solution and 12 grains pyrogallic acid.

Immerse in water before developing.

Note.—Remember that pyro gives the strength, and the alkali the detail ; so that more time given the less alkali is needed.

Should the film be over-exposed, add as soon as possible to the developer a few drops of 60-grain solution bromide potassium.

43.—Developer for Allen and Rowell's Ivory Films.

A.—	Sulphite of soda, cryst	6 ounces
	Carbonate of soda	2½ ounces
	Water	64 ounces
B.—	Water	8 ounces
	Sulphuric acid	20 drops
	Sulphite of soda, cryst	2 ounces
	Pyrogallic acid	1 ounce

Take one ounce of A and one dram of B. Restrain with bromide of potassium.

44.—Soda-Potash Developer for Gelatine Dry-Plates (New York Amateur Club).

Ferro-cyanide potassium	1½ ounces
Carbonate of potassium	1½ ounces
Gran. carbon, of sodium	1 ounce
Cryst. sulphite sodium	2 ounces
Hot distilled water	10 ounces

45.—Soda Developer in One Solution for Gelatine Dry-Plates (Eder's Formula).

Crystal sulphite of soda	5 drams
Crystal carbonate of soda	2½ drams

Dissolve in 2 ounces of boiled distilled water, and after having cooled down add 46 grains of pyro. Keep in well-stoppered bottles, and for use dilute with 5 times its bulk of water.

46.—Soda Developer for Gelatine Dry-Plates (Cooper's Formula).

A.—	Sulphite of soda, cryst	6 ounces
	Distilled water	1 quart

When dissolved, add

	Pyrogallol	1 ounce
B.—	Carbonate of soda, pure, cryst	4 ounces
	Water	1 quart

Take equal parts of A, B, and water. Restrain with bromide of potassium one ounce to water six ounces.

47.—Developer for Eastman's American Films.

Exposure.—To expose the American films in the camera, the film must be supported either by a "film carrier," which holds a single cut sheet and occupies the space of an ordinary glass plate in the regular dry-plate-holder or dark slide, or, the film can be exposed in the roll by means of the Eastman-Walker roll holder, which holds a spool having a band of film wound thereon sufficient for 24 or 48 exposures.

The sensitiveness of the American films run from 18 to 22 Warnerke's sensitometer, and being supported in the camera in one of the ways above described, the exposure is made in the same manner as a glass dry plate.

Development.

A.—Sulphite sodium, pure, (re-crystalized)	8 ounces
Distilled or boiling water	1 quart (32 ounces)
Pyrogallic acid	1 ounce

Dissolve the sulphite in the water first and then add the pyro. Stand until cold.

B.—Carbonate soda, pure, (re-crystalized) not anhydrous or bicarbonate	¼ pound
Water	32 ounces

To develop, pour into a clean tray the following:

A	1 ounce
B	1 ounce
Cold water	2 ounces
Bromide of potassium solution (1 to 6)	20 minims

Immerse the exposed film in a tray of clean, cold water, and with a soft camel's hair brush gently remove the air bells that cling to the surface of the film. As soon as limp remove the film to the tray containing the developer and proceed with the development the same as with a dry plate. The image should commence to appear in 20 to 40 seconds. If the lights come slowly and with no detail in the shadows, add not to exceed one ounce of B. If the image appears too quickly, add 10 to 20 drops more of the

Restrainer.

Bromide potassium	1 ounce
Water	6 ounces

Keep this in a dropping bottle, consisting of an ordinary bottle having two notches cut lengthwise in the cork, on opposite sides.

The film may be examined from time to time by transmitted light by holding it up by the corners. When sufficient density is obtained wash the film in three or four changes of cold water and then immerse in the

Clearing Solution.

Acetic acid	1 dram
Water	32 ounces

The clearing solution is used to remove any possible discoloration caused by the pyro, and gives clear, grey negatives (it can be dispensed with if warmer toned negatives are preferred), after one minute rinse well and immerse in the

Fixing-Bath.

Hyposulphite sodium	4 ounces
Water	16 ounces

Mix fresh fixing bath for each batch of negatives. *Use no alum* in the fixing bath. The negative should be put in the fixing bath film side up, and kept moving while fixing.

Films fix quicker than glass dry plates and the completion of the operation can be ascertained by the even, translucent appearance as seen from the back, while lying in the bath, or by examination by transmitted light.

Oxalate Developer.

The oxalate of iron developer can be used with Eastman's American films, but we do not recommend it.

A.—Oxalate of potash	1 pound
Hot water	48 ounces
Acetic acid	3 drams
B.—Protosulphate of iron	1 pound
Hot water	32 ounces
Acetic acid (or citric acid ¼ ounce)	½ dram
C.—Bromide potassium	1 ounce
Water	1 quart (32 ounces)

These solutions keep separately, but must be mixed only for immediate use.

To Develop.—Take A—six ounces; B—one ounce; C—ten drops. Mix in the order given; use cold.

After exposure, soak the paper in water until limp, then immerse in the developer.

The image should appear slowly and should develop up *strong, clear and brilliant.* When the lights are sufficiently developed, and before washing immerse in the clearing solution as given for the pyro development, then wash and fix.

After fixing, wash in three or four changes of cold water for five or ten minutes and the film is then ready for transferring.

When the oxalate developer is used it is sometimes advisable to use alum in the fixing bath to prevent frilling, but after using it the paper must be stripped as quickly as possible after squeegeeing on to the glass; that is to say, after standing thirty minutes under pressure and *before it becomes entirely dry*, otherwise the substratum will become insoluble.

Transferring the Film.

Coat a clean glass plate, *half an inch larger than the film, all around*, with the following

Rubber Solution.

Masticated India rubber	2 grains
Rectified benzole	1 ounce

or,

Rubber cement	1 ounce
Benzole	9 ounces

NOTE.—The above rubber cement is such as sold at the rubber stores in half-pound cans for 25 cents, and is a mixture of pure rubber and benzole. This article should not be mistaken for the bi-sulphide of carbon and rubber cement used by shoemakers.

Allow the rubber to dry until "dead," say five or ten minutes, then flow with plain collodion made as follows:

Collodion.

Ether	1 ounce
Alcohol (Methylated spirit)	1 ounce
Pyroxyline, soluble gun-cotton	12 grains

As soon as set, wash under tap until greasy lines disappear, then slide the prepared glass into a tray of water, face up, slide the fixed and washed American film negative into the water over the plate, face down, grasp together by the edges and draw plate and negative out of the water, allowing to drain from one end. Carefully squeegee into contact, first protecting the back of the negative by laying on a sheet of rubber, cloth, or strong paper, examine from front for air bells, place under blotter and weight to dry for *thirty minutes only*, then slide plate supporting the negative into pan of water about 120 deg. to 140 deg. Fahr., raise corner of paper with a pin and pull it off, or slide the paper off from the glass sideways, using gentle pressure, leaving the negative film on the glass. Brush gently with camel's hair brush dipped in warm water, transfer plate, negative side up, to a tray containing the following

Soaking Solution.

Glycerine	½ ounce
Alcohol or methylated spirit, or wood alcohol	16 ounces
Ammonia	½ ounce
Water, cold	16 ounces

NOTE.—The ammonia is used to insure adhesion between film and gelatine skin. The glycerine prevents the film from drying brittle. This solution will keep and may be used repeatedly. The alcohol makes the skin dry quick.

Slide a *Gelatine Skin* of the proper size into solution over negative, rough side up, allow skin to soak *one-half minute*, then grasp together with plate and lift out of solution. Squeegee into contact, and stand to dry. When thoroughly dry, flow with plain collodion. When dry, cut around edges and peel off the glass, remove adhering rubber from face of negative by rubbing with palm of hand, or tuft of cotton moistened with benzole.

This method gives a film *negative, varnished on both sides* with a film of plain collodion, which enables it to withstand climatic changes without cracking or softening. The collodion can be dispensed with and the transfer made directly upon the rubber-coated glass if preferred, but the collodion is desirable for reasons above stated. The purpose of the rubber solution is to allow the finished negative to be stripped off the glass when dry. If it were not for this, it would stick to the glass.

If the gelatine skin is soaked too long before squeegeeing on to the negative, it loses the glycerine that keeps it pliable, and will dry hard and brittle—to prevent this, soak only half a minute. If it drys too brittle, use more glycerine in the soaking solution.

Keep film negatives under pressure in printing-frame.

48.—Ferrous-Oxalate Developer for Gelatine Dry-Plates (Dr. Eder's).

A.—Neutral oxalate potassium	200 parts
Distilled water	800 parts

Acidulate with oxalic acid.

B.—Proto-sulphate of iron, cryst	100 parts
Distilled water	300 parts
Sulphuric acid	5 minims
C.—Bromide of potassium	10 parts
Distilled water	100 parts
D.—Hyposulphite of soda	2 parts
Distilled water	200 parts

Mix immediately before use three parts of A with one part of B, and develop. Restrain with a few drops of C.

For over-exposure take less of the iron solution, and add gradually in small portions, as required. To give the negative body use C.

To make soft negatives with fine details, take of

A	2½ ounces
B	½ ounce
C	4 minims
D	6 minims

Plates giving with ordinary developer hard and glassy negatives, give with this modification very satisfactory results.

49.—Hydrochinon Developer for Gelatine Dry-Plates (C. E. von Sothen).

A.—Soda carbonate	60 grains
Water	1 ounce
B.—Hydrochinon	12 grains
Soda sulphite	60 grains
Water	1 ounce

Mix of A one ounce, of B two ounces, with one ounce of water.

50.—Hydrochinon Developer, Cramer's.

A.—Sulphite of Soda	480 grains
Phosphate of Soda	160 grains
Water	8 ounces

Dissolve, filter and add.

Hydrochinon	100 grains
B.—Carbonate of Soda	480 grains
Phosphate of Soda	160 grains
Water	8 ounces

Mix equal parts of A and B.

51.—Hydrochinon Developer, Müller.

A.—Water	10 ounces
Sulphite of soda, cryst	6 drams
Carbonate of potassium	6 drams
B.—Hydrochinon	1½ drams
Water	1 ounce
Alcohol	1 ounce

Mix 1 ounce of A with 1 dram of B.

52.—Hydrochinon Developer, with Lime Water, for Gelatine Dry-Plates.

Lime water	10 ounces
Sulphite of soda	¾ ounce
Sugar	¼ ounce

To three ounces of this solution add four grains of hydrochinon.

53.—"Chautauqua" Developer, with Ammonia, for Gelatine Dry-Plates (Chas. Ehrmann).

A.—Bromide of ammonium	¼ ounce
Water	8 ounces
B.—Aqua ammonia	1 ounce
Water	7 ounces
C.—Pyrogallol	1 dram
Nitric acid	5 minims
Water	12 ounces

Take for correct exposure of A forty minims, of B twenty minims, of C half ounce, and two ounces of water.

54.—"Chautauqua" Developer, with Carbonate of Soda, for Gelatine Dry-Plates.

A.—Dissolve 3 ounces of granulated sulphite of soda, and ¼ of an ounce of meta-bisulphite of potassium in 32 ounces of distilled water and add 1 ounce of pyrogallic acid.

Keep in well stoppered bottles.

B.—Dissolve 8 ounces of granulated, or 16 ounces of crystallized carbonate of soda (common washing soda) in water enough to make a bulk of 32 ounces.

Mix one ounce of water with one dram of A, add a few drops of B, and increase gradually till development proceeds regularly. If necessary, restrain with 10 per cent solution of bromide of potassium.

55.—"Chautauqua" Developer, with Carbonate of Potassium, for Gelatine Dry-Plates.

A.—Water	12 ounces
Pyro	1 ounce
Sulphite of soda, granulated	2 ounces
Bromide potassium	80 grains
Citric acid	60 grains
B.—Water	12 ounces
Sulphite of soda, granulated	1 ounce
Carbonate of potash	3 ounces

One dram of each, A and B, to one ounce of water makes the developing solution.

56.—Ferrous Oxalate.

For bromide prints and transfers see "Eastman's."

57.—"Chautauqua" Developer, with Hydrochinon, for Gelatine Dry-Plates.

A.—Hydrochinon	¼ ounce
Sulphite of soda, granulated	1 ounce
Meta-bisulphite of potassium	30 grains
Water	16 ounces

B.—Carbonate potash	1⅛ ounce
Water	16 ounces

Take equal parts for normal exposures. For over or under-exposures proceed as with pyro. Bromides do not restrain the action of hydrochinon.

58.—DEVELOPERS WITH EIKONOGEN (GOTTHEIL'S).

I.—In Separate Solutions.

A.—Sulphite of soda, cryst	4 ounces
Distilled water	60 "

Dissolve and add,

Eikonogen	1 ounce
B.—Carbonate of soda, cryst	3 ounces
Distilled water	20 "

Mix 3 parts of A with 1 part of B.

II.—In One Solution.

Sulphite of soda in cryst	8 ounces
Carbonate of soda in cryst	3 "
Distilled water	80 "
Eikonogen	1 "

III.—For Instantaneous Exposures.

Sulphite of soda	4 ounces
Carbonate of potash	1 "
Distilled water	30 "
Eikonogen	1 "

While developing with either of the solutions, add 6 to 8 drops of a solution of one part Hyposulphite, 6 parts potassium bromide and 70 parts distilled water.

Do not put acid in any of the solutions.

The sulphite of soda must be in an absolutely perfect condition.

Preliminary Bath.

Hyposulphite of soda	1 grain
Water	5 ounces

If under-exposure is suspected, bathe the plate in this solution for one minute, and then proceed to develop without washing the plate.

59.—DEVELOPER WITH EIKONOGEN (NEWCOMB'S).

Sulphite of soda solution to test 60 degrees hydrometer, carbonate of soda enough to increase to 80 degrees.

Filter and add to each ounce of the solution 6 grains of Eikonogen.

When under-exposures are suspected, accelerate with a few drops of a solution of 1 grain hyposulphite of soda in 2 ounces of water.

Restrain with bromide of sodium.

60.—CLEARING SOLUTION (EDWARD'S).

Alum	1 ounce
Citric acid	1 ounce
Sulphite of iron	3 ounces
Water	20 ounces

This should be freshly mixed.

61.—CLEARING SOLUTION ("CHAUTAUQUA").

Alum	1 ounce
Citric acid	¼ ounce
Water	15 ounces

62.—BELITZKI'S METHOD TO REMOVE THE LAST TRACES OF HYPO.

Chloride of lime	20 grams
Water	1 litre

Add to the milky liquid

Sulphite of zinc	40 grams

dissolved in from 80 to 100 parts of water, shake well and decant.

The clear, supernatant solution of hypochlorite of zinc is kept in well-closed bottles ; one part of it mixed with sixty parts of water will remove the last traces of fixing soda.

The solution remains active as long as it smells of hypochlorous acid.

63.—To Remove Hypo from Films.

A solution of bromine in water, of a light sherry color, destroys the hypo in a gelatine film.

64.—Intensifier, with Mercury and Ammonia, for Gelatine Dry-Plates.

Pour over the well-washed negative a saturated solution of mercuric chloride ; do not keep it on too long, unless the negative is very thin. Wash well, and immerse in bath of

Water	10 ounces
Ammonia	10 minims

Leave the plate in this solution until the black color goes quite through the film. Wash well.

65.—Intensifier (Mercuric) with Sodium Sulphite, for Gelatine Dry-Plates.

Whiten the negative in a saturated solution of mercuric chloride, wash and blacken with a solution of sulphite of sodium 1:5. Wash well.

The reduction is perfect, with a positive black tone.

66.—Intensification of Gelatine Dry-Plates (Scolik's Method with Mercury).

The fixed and well-washed negative is allowed to remain in the following mercuric chloride bath until the film is thoroughly whitened.

Mercuric chloride	1 part
Potassium bromide	1 part
Water	50 parts

The bleaching being complete, the mercuric solution is rinsed off, and the negative is immersed in a mixture of equal parts of saturated solution of sodium sulphite and water, the darkening action will be seen to take place steadily and slowly just as when ammonia is used. Wash away the excess of sulphite.

67.—Intensifier for Gelatine Dry-Plate Negatives (Edwards').

Saturated solution of bichloride of mercury	10 ounces
Iodide of potassium	10 drams

Dissolve the iodide of potassium in ten ounces of water, and pour gradually into the mercurial solution until the precipitate thrown down is *nearly* re-dissolved. Add one ounce of hyposulphite of soda in crystals.

68.—Intensifier, with Cyanide of Silver, for Gelatine Dry-Plates.

Mr. J. E. Thompson gives the following : After fixing and washing the plate well, place it in a solution of

Bichloride of mercury	10 grains
Chloride of ammonium	10 grains
Water	1 ounce

for a few seconds, until it bleaches. Then wash and place in a bath of cyanide of silver until it blackens, made as follows :

Cyanide of potassium	2 ounces
Distilled water	48 ounces
Nitrate of silver	1 ounce
Distilled water	6 ounces

Pour the silver gradually into the cyanide, stirring with a glass rod. The quantities given are about right to form a precipitate which will re-dissolve afterwards. To be used when a few days old.

69.—Dr. Eder's Collodion Intensifier Modified for Gelatine Films.

By E. Vogel, Jr.

The compound recommended is as follows :

Nitrate of lead	2 drams
Ferricyanide of potassium	3 drams
Water	12½ ounces
Glacial acetic acid	1 to 1½ ounces

The negative deposit assumes in this bath the well-known grayish-white color. To darken it the plate must first be washed for a reasonable time in pure water, and then treated in various ways according to the character of the negative.

For half-tone negatives the gray deposit may first be rendered blue by immersing the plates in a solution of ferric-chloride, which color gives place to a brownish-yellow when immersed in dilute ammonia.

To reproductions in lines a high density is given with permanganate of potassium, or by chromate of potassium, with ammonia cupric chloride, etc.

With permanganate a dark-brown is obtained. With bichromate of potassium and ammonia the plate turns yellowish-red, and with cupric chloride brownish-red.

70.—Intensification of Gelatine Dry-Plates with Uranium.

The washed plate should be flooded with a one per cent. solution of uranium nitrate, which should be allowed to remain on the plate for about half a minute or so, and then poured back into the measure, into which a few drops of a two per cent. solution of potassium ferricyanide has previously been added. The mixed solutions are then poured over the plate, and if sufficient intensity is not obtained, more potassium ferricyanide may be added.

Add a few minims of glacial acetic acid.

71.—Reducer for Gelatine Dry-Plate Negatives (Farmer's)

Sat. sol. of ferri-cyanide of potassium	1 part
Hyposulphite of soda solution, 1.5	10 parts

72.—Reducer for Gelatine Negatives (L. Belitzki's).

Potassium ferric-oxalate*	1 to 10 grains
Hyposulphite of soda solution, 1 to 5	1 ounce

With either of the processes the plate to be reduced is immersed in the solution, when the reduction will at once commence. The process must be carefully watched so as not to go to extremes. Afterwards wash thoroughly. Local reductions can be made by mixing the preparations with gum arabic mucilage, and applying it with a soft brush.

73.—Reducer for Gelatine Dry-Plates (J. Bartlett's).

Perchloride of iron	30 grains
Citric acid	60 grains
Water	1 pint

74.—Reducer, with Bichromate, for Gelatine Dry-Plates.

Bichromate of potassium	10 grains
Hydrochloric acid	10 minims
Water	1 ounce

75.—To Reduce Intensity of Negatives.

Rub the parts to be reduced with a soft rag moistened with alcohol, till the density is softened down. For sharply defined outlines use a pointed stick of soft wood dipped in alcohol.

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* This is the green salt separating in old ferrous-oxalate developer.

The method may be well applied for the brightening up of flare spots and halation marks.

ORTHOCHROMATIC METHODS BY BATHING.

76.—Orthochromatic Dry-Plates—F. Ives' Chlorophyll and Eosine Process.

Use any good bromide collodion emulsion that contains no free nitrate of silver. Flow plate as usual, and as soon as the emulsion film sets, flow several times with strong alcoholic solution of chlorophyll from blue myrtle, or plantain leaves, then immerse in water strongly tinted with blue shade eosine, and keep in motion until smooth.

Sensitizes for all colors, including deep ruby red; a very light-yellow screen is sufficient to secure correct rendering of color-tone.

77.—Orthochromatic Dry-Plates—V. Schumann's Cyanine Bath.

Soak the plate in 200 c.c.m. of water and 2 to 4 c.c.m. of ammonia for two to three minutes, then immerse in

Distilled water	200 c.c.m
Alcohol	10 c.c.m
Ammonia	4 c.c.m
Alcoholic solution of cyanine, 1:500	10 c.c.m

78.—Orthochromatic Dry-Plates—Drs. Mallmann and Scolik's Erythrosine Bath.

Preliminary Bath.

A.—Water	200 c.c.m
Ammonia	2 c.c.m

Soak the plate for two minutes.

Color Bath.

Erythosine solution, 1.1000	25 c.c.m
Ammonia	4 c.c.m
Water	175 c.c.m

The plate should not remain longer in this bath than one and a quarter minutes. A longer time depresses the general sensitiveness.

79.—Orthochromatic Dry-Plates—Standard Chinoline Solution—Drs. Mallmann and Scolik.

Alcohol	500 c.c.m
Chinoline red	1 gram

To which are added 50 c.c.m. of a solution of

Alcohol	500 c.c.m
Chinoline blue (cyanine)	1 gram

The above solution is identical with the liquid dye sold under the name "Azaline."

80.—Orthochromatic Dry-Plates, "Chautauqua" Chinoline Bath.

Soak the plate, the emulsion of which should contain but little iodide of silver, for 150 seconds in

Water	6 ounces
Ammonia	30 drops

And color in

Standard chinoline solution	2 drams
Water	32 ounces
Ammonia	1 dram

81.—Obernetter's Method with Nitrate of Silver.

Distilled water	480 c.c.m.=14 ounces 1½ dram
Nitrate of silver	1.25 grams=20 grains
Ammonium carbonate	5 grams=1 dr. 11 grains
Erythrosine solution (1:500)	35 c.c. m=1¼ ounce
Aqua ammonia	4 c.c.m.=1 dr. 8 minims

Bathe the plate in the preliminary solution (see No. 78) for 150 seconds. Without washing flow the sensitizing solution over the plate twice, and dry in the dark closet.

82.—To Prepare Yellow Glass Screens.

Take of crushed (not powdered) curcuma root two ounces, and macerate in ten ounces of alcohol for three days. After filtering the tincture, mix with an equal bulk of ether, and add to each ounce of the mixture six grains of gun cotton.

With this collodion coat a plane parallel glass plate, which must be perfectly white, thin, and without any curvature.

VARNISHES.

83.—Negative Varnish.

Sandarac	4 ounces
Alcohol	24 ounces
Oil of lavender	3 ounces
Chloroform	5 drams

84.—Negative Varnish.

White hard varnish (see No. 85)	15 ounces
Alcohol	25 ounces

This will be found a good and cheap varnish if durability is not required, as it is easily rubbed up for retouching upon and easily cleaned off. Very suitable for enlarged negatives that are not to be retained.

85.—Negative Varnish.

Tough, hard and durable.

Shellac	1¼ ounces
Mastic	¼ ounce
Oil of turpentine	¼ ounce
Sandarac	2¼ ounces
Venice turpentine	¼ ounce
Camphor	20 grains
Alcohol	20 fluid ounces

86.—Negative Varnish.

Sandarac	90 ounces
Turpentine	36 ounces
Oil of lavender	10 ounces
Alcohol	500 ounces

87.—Standard Photographic Varnish.

White shellac	8 ounces
Orange shellac	4 ounces
Sandarac	1 ounce
Alcohol	60 ounces

88.—Retouching Medium.

Gum Damar	70 grains
Yellow resin	6 drams
Spirits of turpentine	4 ounces

89.—Negative Retouching Varnish.

Sandarac	1 ounce
Castor oil	80 grains
Alcohol	6 ounces

First dissolve the sandarac in the alcohol, and then add the oil.

90.—Ground-Glass Varnish.

Sandarac	90 grains
Mastic	20 grains
Ether	2 ounces
Benzole	½ to 1½ ounces

The proportion of the benzole added determines the nature of the mat obtained.

91.—Encaustic Paste.

Pure wax	500 parts
Gum elemi	10 parts
Benzole	200 parts
Essence of lavender	300 parts
Oil of spike	15 parts

PRINTING AND TONING ON ALBUMENIZED OR PLAIN PAPER.

92.—The Silver Printing Bath.

Silver nitrate	50 grains
Water	1 ounce

93.—Modified Silver Bath.

Silver nitrate	50 grains
Ammon. nitrate or magnesium nitrate	50 grains

To secure a neutral state of the bath a little carbonate of silver should be kept at the bottom of the stock bottle.

94.—To Make Sensitized Albumen Paper Durable.

1—Sensitize in the following bath :

Nitrate of Silver	1 ounce
Citric acid	1 ounce
Alcohol	1 ounce
Water	12 ounces

or,

2.—Sensitize the paper in the usual bath, drain well, and when superficially dry float the back of the paper for 20 minutes on a solution of

Citric acid	1 ounce
Water	30 ounces

or,

3.—Sensitize as usual, drain well and wash the paper in 3 or 4 changes of water then float the back on a solution of

Nitrite of potassium	5 ounces
Water	100 ounces

When dry roll the paper up, coated side out and wrap in blotting paper soaked in the Nitrite of potash solution and dried.

95.—Toning Bath (Spaulding's).

Stock Solution.

Water	15 ounces
Gold chloride	15 grains

To make up a toning bath for twenty cabinet size prints, take

Water	10 ounces
Soda bicarbonate	3 grains
Common salt	6 grains
Stock solution of gold	3 ounces

96.—The Price Toning Formula.

Into seven and a half ounces of water dissolve fifteen grains chloride of gold and sodium, then add to it 300 grains of acetate of soda and seven drops of a saturated solution of chloride of lime.

This stock solution should be prepared at least twenty-four hours before being used. Take half ounce of it and mix with seven ounces of water.

97.—The Photographic Times Toning Bath.

Into seven and a half ounces of water put seven and a half grains chloride of gold and sodium. Lable the bottle containing the mixture: *Chloride of gold solution.* Combine six ounces of water with *one ounce of French azotate*, to which add one and a half ounces of the chloride of gold solution.

98.—The Chautauqua Toning Bath.

Dissolve fifteen grains of chloride of gold and sodium in fifteen ounces of water. Take of this solution three ounces, pour it in the toning dish, test for acidity with litmus paper, and *neutralize* with bicarbonate of soda, and add thirty grains of acetate of soda and thirty ounces of water. Prepare the solution an hour before using it.

If warm tones are wanted add a little acetic acid to the last washing water.

For this bath the sensitizing silver should be neutral, for which purpose a small portion of carbonate of silver should be kept in the silver stock bottle.

99.—Charles W. Hearn's Toning Baths.

With Sal Soda.

Distilled or ice water	64 ounces
Acid sol. of ch. of gold (4 grains to 1 ounce)	1 ounce
Saturated solution of sal soda	½ ounce

Should be prepared half hour before use.

100. *With Chloride of Lime.*

Water	40 ounces
Chloride of lime	5 grains
Chloride of gold	4 grains

If the chloride of gold is acid, it may be neutralized with carbonate of lime.

101. *With Citric Acid.*

A.—	Citric acid	1 ounce
	Water	20 ounces
B.—	Chloride of gold	15 grains
	Water	15 ounces

Stock Solution.

Take of A two and a half ounces and make slightly alkaline with saturated solution of bicarbonate of soda; of B, half ounce, and sixty-four ounces of water.

When ready to tone take sufficient of the stock solution, which should never be less than three or four days old, and add thereto one ounce of gold solution B; make alkaline with bicarbonate of soda.

102.—Toning Bath for Albumen Prints (Newcomb's).

Water	1 quart
Phosphate soda	80 grains
Cupric chloride	1 grain

One grain of chloride gold for each sheet of 18x22 paper.

The gold solution should be neutralized with chalk.

103. *With Bicarbonate of Soda.*

Chloride of gold sol. (1 grain to the ounce)	1 ounce
Water	16 ounces
Saturated sol. of bicarb. of soda	10 minims

Allow this bath to ripen for one hour. Should be made up fresh for every time toning.

104.—Abney and Robinson's Toning Baths.

Gold trichloride	1 grain
Sodium carbonate	10 grains
Water	10 ounces

Should be used immediately after mixing. This bath gives purple and black tones.

105.

Gold trichloride	2 grains
Saturated sol. of chloride of lime	2 drops
Chalk	1 pinch
Water	16 ounces

The bath should be prepared with hot water, and be kept for one day before using it.

106.—Schwier's Borax Toning Bath.

Chloride of gold solution, 1:50	3 c.c.m
Borax solution, 1 to 10	100 c.c.m
Water	100 c.c.m

Can be used immediately.

107.—Dr. Liesegang's Toning Bath.—*With Tungstate of Soda.*

Boiling water	1 litre
Tungstate of soda	20 grams
Chloride of gold	1 gram

Can be used immediately after cooling.

108.—Dr. Liesegang's Toning Bath.—*With Phosphate of Soda.*

Water	1 litre
Phosphate of soda	15 grams
Chloride of gold	1 gram

109.—Dr. Liesegang's Toning Bath.—*With Carbonate of Lime* (*Chalk*).

Water	1 litre
Chloride of gold	1 gram
Carbonate of soda	15 grams
Chalk	5 grams

After twelve hours the bath is perfectly clear and colorless, when it is ready for use. It is very durable, and gives fine tones.

110.—Toning Bath for Ready Sensitized Paper.

A.—	Water	1 litre
	Chloride of gold	1 gram
B.—	Water	1 litre
	Borax	10 grams
	Tungstate of soda	40 grams

111.—E. L. Wilson's Toning Bath.

Water	32 fluid ounces
Acetate sodium	60 grains
Chloride sodium	60 grains
Chloride gold	4 grains
Nitrate uranium	4 grains

Neutralize the gold and uranium, previously dissolved in a little water, with sufficient bicarbonate soda. Before using, add gold to renew the bath, as necessary.

112.—Dr. Eder's Durable Toning Bath.

Take pure perchloride of gold, dissolve it in distilled water, neutralize the acidity with carbonate of lime (chalk) or carbonate of magnesia, and filter. Of this solution take as much as represents one grain of the chloride of gold, dissolved, dilute it with nine times its bulk of water, and tone. This solution will keep, when stored in the dark, and will produce good, dark, purple tones.

113.—PRINTING ON PLAIN PAPER.

Prepare the plain paper with

Ammonium chloride	60 to 80 grains
Sodium citrate	100 grains
Sodium chloride	20 to 30 grains
Gelatine	10 grains
Distilled water	10 ounces

or,

Ammonium chloride	100 grains
Gelatine	10 grains
Water	10 ounces

The gelatine is first swelled in cold water and then dissolved in hot water, and the remaining components of the formula are added. The solution is filtered, and when still warm the paper floated upon it for three minutes.

The salted paper is sensitized upon a neutral forty-five-grain silver bath.

114.—RED PRINTS FOR PHOTO-ENGRAVERS.

Citric acid	100 grains
Chloride of ammonium	100 grains
Gelatine	10 grains
Water	10 ounces

Dissolve the citric acid in a small portion of water, and exactly neutralize with carbonate of soda (228 grains of common washing soda are required).

Float the paper on this bath for one to two minutes, and sensitize upon a fifty-grain nitrate of silver solution. Fix in fresh hypo, without toning.

ARISTOTYPE OR CHLORIDE OF SILVER COLLODION PRINTING.

115.—ARISTOTYPE, OR CHLORIDE OF SILVER COLLODION.

A.—Alcohol	100 c.c.m.
Nitrate of silver	8 grams
B.—Alcohol	100 c.c.m.
Chloride of strontium	2 grams
C.—Water	100 c.c.m.
Citric acid	5 grams
D.—Alcohol	100 c.c.m.
Ether	100 c.c.m.
Gun cotton	4 grams

To 100 c.c.m. collodion (D) add first, by constant agitation, 10 c.c.m. of B and 10 c.c.m. of C ; finally add 5 c.c.m. of A by vigorously shaking the mixture. The resulting emulsion is allowed to settle for twenty-four hours, and is then used for coating paper.

116.—CHLORIDE OF SILVER COLLODION (GELDMACHER'S).

Solution 1.

Gun cotton	6¼ drams
Ether	15 ounces
Alcohol	15 ounccs
Castor oil	1 dram

Solution 2.

Nitrate of silver	5 drams 8 grains
Water	6 drams
Alcohol	1¼ ounces

Dissolve in a warm water bath.

Solution 3.

Citric acid	1 dram 15 grains

dissolved in

Alcohol	2½ ounces

and

Chloride of strontium	1 dram 15 grains

dissolved in

Alcohol	2½ ounces

Make the two solutions separately and mix.

After all the solutions have been made add No. 3 to No. 1, shake vigorously, and by subdued light add gradually small portions at a time the No. 2 solution by constant agitating.

After an hour ripening the collodion emulsion is ready for use.

The paper to be coated must be furnished with a substratum of sulphate of barium and gelatine.

117.—Toning Bath for Aristotypes.

A.—	Sulpho-cyanide of ammonium	40 grams
	Hyposulphite of soda	3 grams
	Carbonate of soda	1 gram
	Water	1½ litres
B.—	Chloride of gold	2 grams
	Chalk	teaspoonful
	Water	1½ litres

Mix A and B in equal parts. B must be poured into A, not *vice versa.* Or

Water	1 litre
Hyposulphite of soda	120 grams
Common salt	60 grams
Chloride of gold in solution	1 gram

118.—Liesegang's Toning Bath for Aristotypes.

A.—	Water	20 ounces
	Sulpho cyanide of ammonium	1 ounce
	Alum	1 ounce
	Saturated solution of carbonate of ammonium	20 drops
B.—	Water	50 ounces
	Chloride of gold	15 grains

119.—A. Stieglitz' Toning Bath for Aristotypes.

1.	Water	32 ounces
	Phosphate of soda	3 drams
2.	Terchloride of gold	15 grains
	Water	16 ounces

Mix. Allow to stand for twenty-four hours.

120.—Liesegang's Combined Toning Bath.

Water	32 ounces
Hyposulphite of soda	8 ounces
Sulpho cyanide of ammonium	1 ounce
Acetate of soda	½ ounce
Saturated solution of alum	2 ounces

and

Water	8 ounces
Chloride of gold	15 grains
Chloride of ammonium	30 grains

Pour the gold solution into the hypo solution, then add thirty grains of freshly prepared chloride of silver.

121.—Dr. Stolze's Combined Toning Bath for Aristotypes.

Hyposulphite of soda	35	grams
Ordinary salt	9	
Alum	4	
Sulpho-cyanide of ammonium	2	
Water	150 to 200 c. c. m.	

The compound will have matured for use in four to eight days.

Decant the clear solution from the deposit formed, and filter. Immediately before use, add to above quantity, 2 c.c.m. chloride of gold solution 1:100. If the solution does not act with sufficient energy, a few c.c.m. of saturated alum solution may be added.

PRINTING ON SUBSTANCES OTHER THAN PAPER.

122.—Collodion for Porcelain Pictures.

Fennemore's Method.

A.—	Negative gun cotton	60 grains
	Alcohol	2 ounces
	Ether	3 ounces

Dissolve 120 grains nitrate of silver in three ounces of hot alcohol, and add by constant stirring to the above collodion.

B.—	Chloride of strontium	32 grains
	Citric acid	24 grains

Reduce to a fine powder and dissolve in four ounces of alcohol ; add

Ether	4 ounces
Gun cotton	60 grains

The two collodions are to be mixed in equal proportions.

123.

Hearn's Method.

A.—	Alcohol	7 ounces
	Ether	9 ounces
	Gun cotton	112 grains
B.—	Nitrate of silver	486 grains
	Distilled water	1 ounce
C.—	Chloride of calcium	128 grains
	Alcohol	4 ounces
D.—	Citric acid	128 grains
	Alcohol	4 ounces

Decant eight ounces of A, add sixty-four drops of B in small portions, stirring up well after every addition, and four drams of C in the same way. Finally four drams of D must be added in the same manner as the calcium solution.

124.—Printing on Silk.

Boiling water	20 ounces
Chloride of ammonium	100 grains
Iceland moss	60 grains

When nearly cold, filter and immerse the silk for fifteen minutes. Sensitize for fifteen minutes in an acid 20-grain silver bath, and when dry stretch the fabric over cardboard. Print deeper than usual and tone in

Water	20 ounces
Acetate of soda	2 drams
Chloride of gold	3 grains
Common whiting	a few grains

125.—Making Silver Prints on Wood.

Gelatine	45 grains
White soap	45 grains
Water	5¼ fluid ounces

Soak the gelatine in the water for five or six hours, then dissolve it with the aid of a water bath. Cut the soap into small pieces, and add to the gelatine solution, stirring the whole with a glass rod to insure a perfect mixture, then add powdered alum until the froth disappears, and strain through muslin. Cover the block with this mixture and a little zinc white, then wipe off so that a very thin film will be left, rubbing it gently, so that the film may be of as even a thickness as possible. After drying, apply with a wide badger's-hair brush a coating of the following:

Albumen	3¼ fluid ounces
Water	2½ fluid ounces
Sal ammonia	67½ grains
Citric acid	18¾ grains

Whip the albumen to a froth, and allow it to settle; to the limpid portion add the water, then the sal ammonia, and carefully stir with a glass rod, then add the citric acid. When the block is dry, sensitize with a solution of

Water	3¼ fluid ounces
Nitrate of silver	187½ grains

Pour this upon the surface of the block, spread it evenly with a glass rod, and pour off the excess. When the block is dry, expose it under a negative in the usual manner, until it is printed the exact shade desired. When printed, immerse the printed surface in a very strong solution of salt for about three minutes. Then wash it under a stream of water for a short time, and fix it by placing it face downward in a saturated solution of hyposulphite of soda. After fixing, wash under a stream of water for about ten minutes; when dry, it is finished, and ready for the engraver.

126.—To Transfer Photographs upon Wood for Engraving.

Float the reverse side of sensitized albumen paper for fifteen minutes upon a 4 per cent. solution of bichromate of potassium, dry well, expose to light till the picture is fairly visible, place the print upon a glass plate under water until the unacted-on bichromate is dissolved out; after removal from the water, roll in with fatty ink.

When the picture is sufficiently blackened, and nearly dry, it can be transferred upon the engraver's block by rubbing it on carefully.

PRINTING WITH THE SALTS OF IRON.

127.—Cyanotypes or Blue Prints.

A.—Citrate of iron and ammonia	1⅞ ounces
Water	8 ounces
B.—Ferricyanide of potassium	1¼ ounces
Water	8 ounces

Mix equal parts immediately before use and float the paper, Rives plain, upon it for three minutes; hang up to dry.

128.—Converting Blue Prints into Brown Prints.

Blue ferro-prussiate photographic prints may be converted into brown prints by the following process:

The positive blue print, thoroughly washed and dried, is plunged into a solution of ammonia, in which it is kept until it has nearly or entirely lost its color. (The operation lasts from two to four minutes). The print is rinsed and plunged into a bath of tannic acid, the operation being stopped as soon as the desired sharpness and tone are obtained.

This last operation requires about ten minutes. If at the end of this time the color be not dark enough, it is intensified by adding to the bath a few drops of ammonia. After a lapse of one or two minutes, rinse in abundant water.

1. Solution for preparing the sensitized paper:

Tartrate of iron and potash	15 parts
Red prussiate of potash	12 parts
Rain water	250 parts

2. Solution to remove the color of the print :

Ammonia of 23 deg. Beaumé	100 parts
Rain Water	800 parts

5. Solution to give the brown tone :

Tannic acid	10 parts
Rain water	500 parts

Dissolve and filter.

129.—Toning Blue Prints.

Blue prints may be given the black tone by plunging them into a solution of four parts of potash in one hundred parts of water ; then, when the blue color has entirely disappeared under the action of the potash, and a yellowish color has taken its place, they are immersed in a solution of four parts of tannin in one hundred parts of water ; then washing them again we obtain prints whose tone may be assimilated to that of pale writing ink.

130.—Pellett's Method for Making Blue Lines upon White Ground.

The formula is composed as follows :

Gum arabic	385	grains
Sodium chloride	46	grains
Tartaric acid	62	grains
Perchloride of iron	123	grains
Water	3½	ounces

Highly sized and smooth paper is evenly coated with this mixture, dried in the dark, and exposed under a negative.

Develop with a saturated solution of ferrocyanide of potassium. Fix in a one to twenty solution of hydrochloric acid.

PRINTING BY DEVELOPMENT.

131.—Formula for Eastman's Permanent Bromide Paper.

A.—Oxalate of potash	1 lb
Hot water	3 pints

Acidify with sulphuric or citric acid. Test with litmus paper.

B.—Proto-sulphate of iron	1 lb
Hot water	1 quart
Sulphuric acid (or citric acid ¼ ounce)	½ dram
C.—Bromide potassium	1 ounce
Water	1 quart

These solutions keep separately, but must be mixed only for immediate use.

To Develop.

Take in a suitable tray—A, six ounces ; B, one ounce ; C, half dram.

Mix in the order given ; use cold. After exposure soak the paper in water until limp ; then immerse in the developer.

The immage should appear slowly, and should develop up strong, clear, and brilliant. When the shadows are sufficiently black, pour off the developer, and flood the print with the

Clearing Solution.

Acetic acid	1 dram
Water	1 quart

Do not wash the print after pouring off the developer, and before applying the clearing solution.

Use a sufficient quantity to flow over the print, say two ounces for an 8x10. Allow it to act for one minute, and then pour it off and apply a fresh portion; repeat the operation a third time, then rinse in pure water, and immerse for ten minutes in the

Fixing-Bath.

Hyposulphite soda	3 ounces
Water	1 pint

Enamelling.

Prints on smooth paper ("A" or "B") may be given a beautiful polished surface, superior to that obtained by burnishing, in the following manner: Sprinkle the surface of a glass plate with powdered French chalk, rub it evenly over the surface with a tuft of cotton wool, continuing to lightly rub it until the chalk is all removed, then coat the glass with the following

Collodion.

Soluble gun cotton	48 grains
Alcohol	4 ounces
Sulphuric ether	4 ounces

As soon as the collodion is well set, slide it face up into a tray of water, in which is floating, face down, the permanent bromide print, which has just been fixed and washed, grasp the plate by one end and lift together from the water, avoiding bubbles, and draining the water from the opposite end; squeegee the print into contact with the plate, and set away to dry. Before the print is quite dry, apply a coat of starch paste to the back. After drying, the print can be peeled off from the glass, and the face will present a polish almost as high as the surface of the glass from which it has been removed. The print is then ready to mount, as follows: Moisten the face of the mount with a damp sponge, and lay it upon the print; rub down with a soft cloth, and put under pressure to dry.

Another Method.

Squeegee the wet print, face down, on a polished piece of hard rubber or ebonite, when dry the print will peel off with a fine polished surface. The print should be slipped on to the rubber plate under water to avoid air bells.

Flexible Prints.

Permanent bromide prints soaked in a mixture of glycerine, 5 ounces, and water 25 ounces, and dried, will not curl, and may be used for book illustrations unmounted. The heavier papers "B" and "C" are especially adapted for this purpose.

Straightening Unmounted Prints.

After drying, prints may be straightened by the scraping action of a sharp-edged ruler applied to the back; the corner behind the ruler being lifted as the ruler is passed along.

132.—GELATINO-CHLORIDE PAPER FOR DEVELOPMENT.

The following method, recommended by Mr. B. J. Edwards, will be found simple, practical, and capable of yielding the finest results:

The Emulsion.

1.	Gelatine	300 grains
	Cold water	4 ounces
2.	Nitrate of silver	240 grains
	Distilled water	2 ounces
3.	Chloride of ammonium	100 grains
	Water	4 ounces

Mix separately. Soak the gelatine for fifteen minutes; then warm all the solutions to about 120 deg. Fahr. Now by yellow light add the silver solution to the gelatine, and then the chloride, adding gradually with constant stirring. Keep the emulsion at a temperature of 120 deg. Fahr. for an hour, then allow it to set. When set, wash as described above for bromide of silver emulsion. Then melt, add one ounce of alcohol and one-half an ounce of gelatine, and filter. The emulsion is now ready for coating the paper, which is done precisely as in the case of the bromide emulsion, except that ordinary gas or kerosene light may be used.

Development.

Make a stock solution as follows:

Citric acid	5 ounces
Distilled water	20 ounces
Strong ammonia	2 ounces

Three parts of this, mixed with one part of the ordinary ferrous oxalate developer, form the developer.

With medium exposure this developer will give a rich purple tone. For black tones, give a shorter exposure, and develop with equal parts of the above solution and the ferrous oxalate developer. By decreasing the strength of the developer, any shade of color from black to ruby-red may be obtained. The warmer tones are produced by adding six or eight parts of the citrate of ammonia solution to one part of the ferrous oxalate.

It is well to begin development with a solution weak in ferrous oxalate, adding more if needed.

The fixing is done in the usual hyposulphite of soda bath, one to six.

This method is strongly recommended to amateurs, on account of the great range of beautiful tones which may be given to the prints.

133.—Directions for Using Eastman's Transferotype Paper.

A.—Oxalate of potash	1 pound
Hot water	48 ounces
Acetic acid	3 drams
B.—Proto-sulphate of iron	1 pound
Hot water	32 ounces
Acetic acid (or citric acid, ¼ ounce)	½ dram
C.—Bromide potassium	1 ounce
Water	32 ounces

These solutions keep separately, but must be mixed only for immediate use. Use cold.

The paper must be manipulated only in yellow or ruby light, same as a slow dry plate.

The exposure may be made by contact, or in the copying or enlarging camera as circumstances require.

In contact printing use gas or kerosene light for the exposure, and place the printing frame eighteen inches or two feet distant. The exposure will vary according to the intensity of light and strength of negative. A few trials with small pieces of paper will give the operator a general idea as to the exposure required. With a No. 2 kerosene burner and a good quick printing negative, two feet distant, the exposure will be from fifteen to thirty seconds.

If the exposure is made in the camera, use an Eastman carrier in an ordinary dark slide and reverse the negative so as to get a non-reversed transfer, (contact prints will be reversed unless double transfer is resorted to). The time of exposure can be determined by a few trials with small pieces of paper.

To Develop.

Take in a suitable tray—A, six ounces; B, one ounce; C, half dram.

Mix in the order given ; use cold. After exposure, soak the paper in water until limp, then immerse in the developer.

The image should appear slowly, and should develop up strong, clear and brilliant. When the shadows are sufficiently black, pour off the developer and flood the print with the

Clearing Solution.

Acetic acid	1 dram
Water	32 ounces

Do not wash the print after pouring off the developer and before applying the clearing solution.

Use a sufficient quantity to flow over the print, say two ounces for 8x10. Allow it to act for one minute and then pour it off and apply a fresh portion ; repeat the operation a third time, then rinse in pure water and immerse for ten minutes in the

Fixing-Bath.

Hyposulphite soda	3 ounces
Water	16 ounces

Alum must not be used in the fixing bath, as it will prevent the transferring of the print.

After fixing, wash thoroughly for half an hour in six or eight changes of water. The print is then ready for

Transferring.

Lay the wet print, face down, upon the object to which it is desired to transfer the image. The surface may be polished or ground glass, porcelain, wood, prepared canvas, ivory or any substance which will withstand the action of hot water and allow the image to adhere. It must be perfectly clean and free from grease or oil. Squeegee the wet print carefully into contact with the surface, and put it under a blotter and weight to dry. When dry, pour hot water upon the back of the picture until the paper blisters, then run a pin under one corner of the paper and pull it gently away. After removing the paper, gently rub the surface of the picture with a tuft of cotton moistened with warm water, and set away out of reach of dust to dry.

The paper may be stripped any time *after* it has been *thirty minutes* under the blotter, but it is safer to allow it to thoroughly dry.

The proper temperature for the hot water depends greatly upon whether the paper is dry or not ; if dry, it should be about 160 deg. to 180 deg. Fahr., if only thirty minutes has elapsed after squeegeeing down, the water should be about 110 deg. Fahr., and the temperature gradually raised by the addition of boiling water until the paper blisters.

Thirty minutes is the least time that should be allowed for drying ; otherwise there is danger of the picture leaving the support.

Clean dishes. Clean hands.—The faintest trace of hyposulphite of soda or pyrogallic acid, is fatal to good results in developing transferotype paper, and the operator cannot be too careful to avoid any contamination, The tray used for developing with oxalate should never be used for anything else.

Warm Tones with Transferotype.

Warm tones, running from a rich brown to brilliant red, may be easily obtained *after* fixing and transfer (the image will not transfer after toning) as follows :

A.—Potassium ferricyanide, (not ferrocynide)	100 grains
Water	24 ounces
B.—Uranium nitrate	100 grains
Water	24 ounces

These solutions keep separately, but must be mixed only for immediate use.

Take equal parts of A and B and immerse the image therein until the desired tone is obtained, then wash thoroughly, and then immerse for five minutes in a fresh fixing bath.

Hyposulphite soda	3 ounces
Water	16 ounces

Wash thoroughly.

The darker the print the deeper the tone. As this process intensifies the print, medium light prints give the best results. The above formula gives warm red tones. Rich browns are best secured by leaving the print in the toning solution only until it commences to turn, then immersing in a weak solution of common alum, then wash and fix as above.

134.—To Tone Bromide Prints with Platinum.—E. Vogel.

Float the print on

Potassium platino-chloride	15 grains
Distilled water	32 ounces
Hydrochloric acid	2½ drams

for twenty minutes, wash and remove to a fifteen per cent. solution of copper chloride. If by this operation, vigor and depth of tone is reduced, re-develop with ferrous oxalate. The method yields warm tones.

USEFUL RECEIPTS.

135.—Labarraque's Solution.

Chloride of lime	2 ounces
Carhonate of soda	4 ounces
Water	40 ounces

Mix the chloride of lime with thirty ounces of the water, and dissolve the carbonate of soda in the remainder. Mix, boil and filter.

136.—Eau de Javelle.

Dry chloride of lime (hypo chlorite of lime)	2 ounces
Carhonate of potash	4 ounces
Water	40 ounces

Mix the chloride of lime with half of the water; dissolve the carbonate of potash in the remainder. Mix, boil and filter.

137.—A Few Remedies Against Blistering of Albumen Paper.

Do not dry the paper by excessive heat.
Avoid acidity in solutions.
Moisten the print before washing with a sponge saturated in alcohol.
Immerse the print before fixing in a weak alum bath.
Add a trace of aqua ammonia to the fixing-bath.

138.—Matt Black Varnish.

A tolerably strong solution of sandarac in alcohol, mixed wtth fine lamp-black, drys without gloss, becomes hard without being brittle, and may be applied with a fine brush upon almost any substance.

139.—Invisible Ink.

Chloride of cobalt	50 grains
Distilled water	1 fluid ounce
Glycerine	10 minims

Dissolve the chloride of cobalt in the distilled water, and add the glycerine.

Writing executed with this ink is invisible on paper, but on warming the writing turns blue. On exposure to damp air, it becomes invisible again.

140.—MAKING PAPER ADHERE TO METAL.

Gum tragacanth	30 grammes
Acacia gum	120 grammes
Water	500 c.c.

141.—TO PRECIPITATE GOLD FROM SPENT SULPHO-CYANIDE TONING BATHS.

Add sulphuric acid, and heat when the gold will separate.

142.—TO KEEP UNMOUNTED ALBUMEN PRINTS FLAT.

Soak them in equal parts of alcohol, glycerine and water; dry between blotting paper under slight pressure.

143.—THE STRIPPING OF AMERICAN FILMS.

From pyro-stained and presumably tanned gelatine is much facilitated by soaking the negative, after thoroughly washing, in a dilute solution of hydrochloric acid.

144.—MAGIC PHOTOGRAPHS.

Fix an albumen print in perfectly fresh hypo solution and wash well, and soak it in a solution of 1 part bichloride of mercury, ¼ of a part of chloride of ammonium in 60 parts of water, till the photograph is bleached out.

The picture will appear again when brought into contact with hypo solution, or moistened blotting paper previously prepared with the fixing soda.

145.—SOLUTION FOR MOUNTING PRINTS WITHOUT THEIR COCKLING.

Nelson's No. 1 photographic gelatine	4 ounces
Water	16 ounces
Glycerine	1 ounce
Alcohol	5 ounces

Dissolve the gelatine in the water, then add the glycerine, and lastly the alcohol.

146.—PERMANENT PASTE.

Arrowroot	10 grams
Water	100 grams

in which one gram of gelatine has been soaked, and boil. After cooling add ten grams of alcohol and a few drops of carbolic acid.

147.—LEATHER COLLODION.

2 p.c. collodion	100 parts
Castor oil	4 parts

148.—LUBRICATOR FOR HOT BURNISHING.

Cetaceum	10 grams
Castile soap	10 grams
Alcohol	1 kilogramme

149.—TO REMOVE SILVER STAINS FROM THE HANDS.

Sulphate of soda	½ ounce
Chloride of lime	¼ ounce
Water	1 ounce

Mix thoroughly, and apply with an old toothbrush.

150.—GELATINE SOLUTION FOR STRIPPING PLATES. (CARBUTT'S).

Water	9 ounces
Gelatine	1 ounce
Glycerine	¼ ounce

Swell the gelatine in cold water and dissolve by the heat of a water bath and filter through muslin at a temperature of 100 to 110 deg. Fahr.; flow over the well-dusted negative, using one fluid dram of the solution to each four square inches of surface. Guide to the edges of the plate with your finger, and remove air bells with a soft-pointed paper. Allow to set in horizontal position, and when perfectly dry, detach the film from the glass. Stripped films may be kept between the leaves of a book.

Plates to be stripped are, previously to coating, prepared for that purpose.

151.—TO MAKE TRANSPARENCIES ON ALBUMEN PAPER.

Print on the back of heavily-silvered albumen paper till the picture is perfectly well printed out, by viewing the paper by transmitted light.

Tone and fix as usual, and, when dry, make the paper translucent with

Poppy oil	1 ounce
Balsam fir	¼ ounce
Spirits turpentine	½ ounce

152.—TO FROST A SKYLIGHT.

Very thin starch paste, to which unboiled starch has been added. Must be free from lumps, and be daubed on with a large bristle brush.

153.—TO KEEP THE HANDS SOFT AND WHITE.

Apply before retiring:

Glycerine	2 ounces
Bay rum	6 ounces
Oil cajeput	1 dram
Oil bergamat	1 dram

Mix well.

154.—TO REMOVE NITRIC ACID STAINS FROM HANDS OR GARMENTS.

Touch the stains with solution of permanganate of potassium; wash, rinse in dilute hydrochloride acid, and wash again.

155.—TO REMOVE YELLOW STAINS FROM BROMIDE PRINTS.

Soak for one or two hours in

Acetic acid	2 ounces
Sat. oxalate of potassium solution	4 ounces

156.—TO REMOVE PYRO STAINS FROM FINGERS.

Wash with a 10 per cent. solution of oxalic acid, or sulphuric acid, diluted with water (1 : 20).

157.—TO REMOVE YELLOW STAINS FROM PYRO-DEVELOPED NEGATIVES.

Bathe them in sulphurous acid water or in a 10 per cent. solution of sulphite of soda, to which a few drops of sulphuric acid have been added.

158.—TO REMOVE THE ODOR OF HYDROSULPHATE OF AMMONIA FROM THE DARK ROOM.

Sprinkle the floor with a solution of nitrate of lead.

159.—TO AVOID HALATION.

A quick drying coating, which is applied to the back of the plate, consists of collodion, with which any dark red or brown pigment is mixed. Spanish brown or rouge answers well.

160.—To Recover Silver Bromide from Waste Emulsion.

Let the emulsion be melted, and then add a small quantity of hydrochloric acid, following by boiling for two or three minutes. The silver bromide precipitates, and the destroyed gelatine is then poured off. The bromide is then placed among the other residues for reduction.

161.—Toning Bath for Gelatine Lantern Slides.

Chloride of platinum	1 grain
Hydrochloric acid	1 minim
Water	32 ounces

162.—Compound for Blocking out Large Portions of a Negative.

Mix asphaltum varnish with fine lamp-black and apply with a camel's-hair brush.

Should be kept in well-stoppered bottles.

163.—Flash-light Powder for Orthochromatic Plates.

Pure metallic magnesium powder	10 grains
Nitrate of soda (finely powdered)	from 50 to 70 grains

164.—Largest and Smallest Quantities of Chemicals Admitted to the Pyro Developer.

	Largest.	Smallest.
Pyro, per ounce	10 grains	1 1-4 grains
Sulphite of soda	80 grains	5 grains
Carb. of soda	40 grains	1 1-5 grains
Carb. of potash	21 2-10 grains	5 grains

165.—Consumption of Chemicals in Silver Printing on Albumenized Paper.

Of one hundred parts of silver used in the albumen printing process will be found

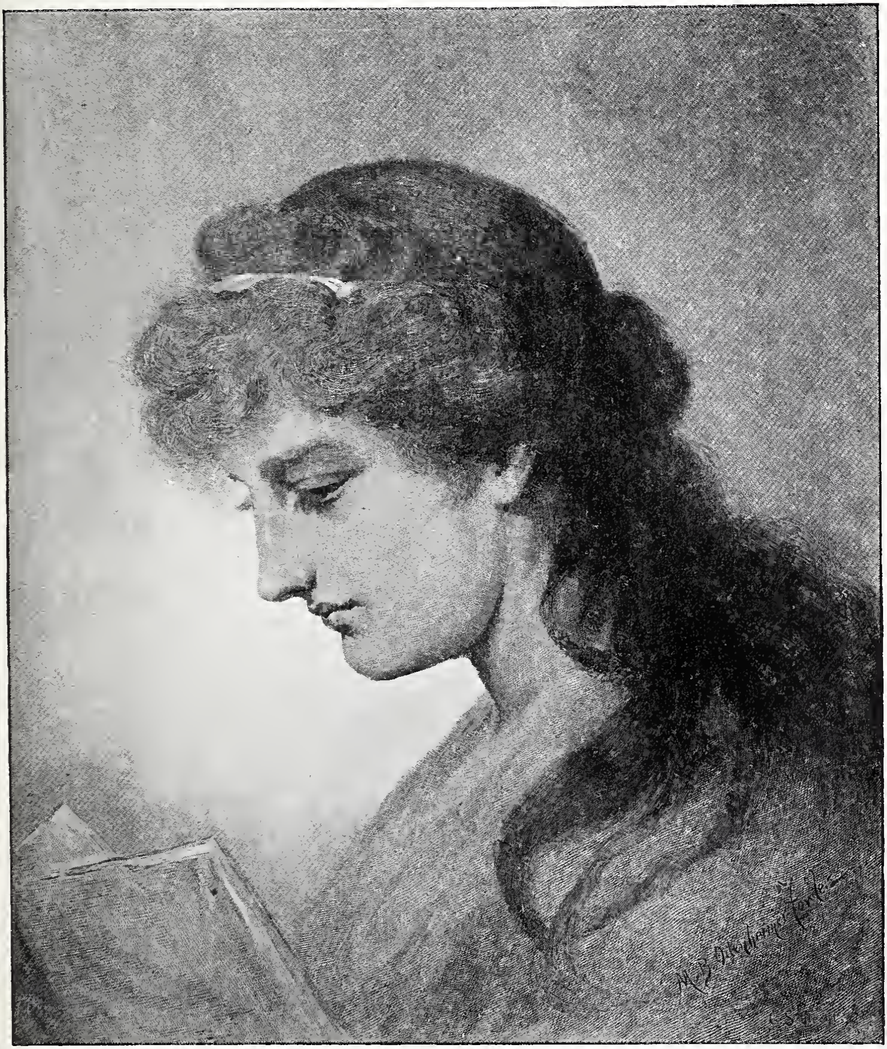
In the finished print	3 per cent
In filters, blotters and cuttings	7 per cent
In the wash water before toning	50 to 55 per cent
In the fixing bath	30 to 25 per cent
In the wash water after fixing	5 per cent

Ninety per cent. of the silver used may be recovered.

One sheet of paper will take from the silver bath from thirty to forty-five grains of nitrate of silver.

One sheet of paper requires to tone one and one-half grains of gold (one decigram).

About eighty to ninety grains of hyposulphite of soda are necessary to fix one sheet of paper.



Mezzotint Engraving Reproduced. A PORTRAIT STUDY. F. A. Ringler & Co., N. Y.

Photographed by Chas. Wager Hull. Electro-Light Engraving Co., N. Y.

YACHTING ON THE SOUND.

UNITED STATES WEIGHTS AND MEASURES.

ACCORDING TO EXISTING STANDARDS.

LINEAL.

12 inches = 1 foot.
3 feet = 1 yard.
5.5 yards = rod.
40 rods = 1 furlong.
8 furlongs = 1 mile.

Inches.	Feet.	Yards.	Rods.	Furlong.
12				
36	3			
198	16.5	5.5		
7,920	660	220	40	
63,360	5,280	1,760	320	8

SURFACE—LAND.

144 sq. ins. = 1 sq. ft.
9 sq. ft. = 1 sq. yd.
30.25 sq.yds.= 1 sq.rod.
40 sq.rods.= 1 sq.rood.
4 sq. roods = 1 acre.
640 acres 1 sq. mile.

Ft.	Yds.	Rods.	Roods.	Acres.
9	1			
272.25	30.25	1		
10,890	1,210	40	1	
43,560	4,840	160	4	1
27,878,400	3,097,600	102,400	2,560	640

VOLUME—LIQUID.

4 gills = 1 pint.
2 pints = 1 quart.
4 quarts = 1 gallon

Gills.	Pints.	Cub. In.
8		
32	8	231

FLUID.

Gallon.	Pints.	Ounces.	Drams.	Minims.	Cubic Centimetres.
1	8	128	1,024	61,440	3,785.441
	1	16	128	7,680	473.180
		1	8	480	29.574
			1	60	3.697

16 ounces, or a pint, sometimes called a pound.

TROY WEIGHT.

Pound.	Ounces.	Pennyweights.	Grains.	Grams.
1	12	240	5,760	373.25
	1	20	480	31.10
		1	24	1.55

APOTHECARIES' WEIGHT.

lb. Pound.	℥ Ounces.	ʒ Drams.	℈ Scruples.	gr. Grains.	Grams.
1	12	96	288	5,760	373.25
	1	8	24	480	31.10
		1	3	60	3.89
			1	20	1.30
				1	.06
				15½.	1.00

The pound, ounce, and grain are the same as in Troy weight.

AVOIRDUPOIS WEIGHT.

Pound.	Ounces.	Drams.	Grains (Troy).	Grams.
1	16	256	7,000	453.60
	1	16	437.5	28.35
		1	27.34	1.77

ENGLISH WEIGHTS AND MEASURES.

APOTHECARIES' WEIGHT.

SOLID MEASURE.

20 Grains = 1 Scruple = 20 Grains.
3 Scruples = 1 Dram = 60 Grains.
8 Drams = 1 Ounce = 480 Grains.
12 Ounces = 1 Pound = 5760 Grains.

FLUID.

60 Minims = 1 Fluid Dram
8 Drams = 1 Ounce.
20 Ounces = 1 Pint.
8 Pints = 1 Gallon.

The above weights are those usually adopted in formulæ.

All Chemicals are usually sold by

AVOIRDUPOIS WEIGHT.

27$\frac{11}{32}$ Grains = 1 Dram = 27$\frac{11}{32}$ Grains.
16 Drams = 1 Ounce = 437½ Grains.
16 Ounces = 1 Pound = 7000 Grains.

Precious Metals are usually sold by

TROY WEIGHT.

24 Grains = 1 Pennyweight = 24 Grains.
20 Pennyweights = 1 Ounce = 480 Grains.
12 Ounces = 1 Pound = 5760 Grains.

NOTE.—An ounce of metallic silver contains 480 grains, but an ounce of nitrate of silver contains only 437½ grains.

U. S. FLUID MEASURE.

Gal.	Pints.	Ounces.	Drams.	Mins.	Cub. in.	Grains.	Cub. C. M
1 =	8 =	128 =	1,024 =	61,440 =	231. =	58,328.886 =	3,785.00
	1 =	16 =	128 =	7,680 =	28.875 =	7,291.1107 =	473.11
		1 =	8 =	480 =	1.8047 =	455.6944 =	29.57
			1 =	60 =	0.2256 =	56.9618 =	3.70

IMPERIAL BRITISH FLUID MEASURE.

Gal.	Pints.	Ounces.	Drams.	Mins.	Cub. in.	Grains.	Cub. C. M.
1 =	8 =	160 =	1,280 =	76,800 =	277.27384 =	70,000. =	4,543.487
	1 =	20 =	160 =	9,600 =	34.65923 =	8,750.	567.936
		1 =	8 =	480 =	1.73296 =	437.5 =	28.396
			1 =	60 =	0.21662 =	54.69 =	3.549

LA PHOTOGRAPHIE DANS LES ARTS LES SCIENCES ET L'INDUSTRIE. Par Albert Londe. Paris: Gauthier Villiers et Fils, 1888, 52 pp.

THE METRIC SYSTEM OF WEIGHTS AND MEASURES.

THE meter is a measure of length equal to 39.370 English inches, or 39.368 American inches, a standard of linear measure supposed to be the ten-millionth part of the distance from the equator to the north pole, as ascertained by actual measurement of an arc of the meridian.

This system, formed on the meter as the unit of length, has four other leading units, all connected with and dependent upon this. Hence, we have:

1. The meter, which is the unit of measures of length.
2. The are, which is the unit of surface, and is the square of the meter.
3. The litre, which is the unit of measures of capacity, and is the cube of a tenth part of the meter.
4. The stere, which is the unit of measures of solidity, having the capacity of a cubic meter.
5. The gram, which is the unit of measures of weight, and is the weight of that quantity of distilled water at its maximum density, fills the cube of a hundredth part of the meter.

Each unit has its decimal multiples and sub-multiples, that is weights and measures ten times larger, or ten times smaller, than the principal units. The prefixes denoting multiples are derived from the Greek, and are: Deka, ten; hecto, hundred; kilo, thousand; and myria, ten thousand. Those denoting sub-multiples are taken from the Latin, and are: Deci, ten; centi, hundred (like in centigram or centimeter); and mili, thousand.

The metric system has been adopted by many nations, the English excepted. In America its use has been made optional, but is legalized by Congress. All photographic formulæ received from the continent of Europe express values and quantities with metrical weights and measures. To utilize them direct without translating into the expressions of the English system, the student is advised to procure gram weights and cubic centimeter graduates, and substitute them for those denoting quantities according to the old plan.

As an assistance to those who cannot acquire these aids, we annex tables taken from the "British Almanac of Photography," which convert grams and cubic centimeters into English grains, drams, and ounces sufficiently correct for practical purposes.

METRIC FLUID MEASURES.

THE cubic centimeter, usually represented by "c.c.," is the unit of the metric measurement for liquids. It contains nearly seventeen minims of water; in reality, it contains 16·896 minims. The weight of this quantity of water is one gram. Hence it will be seen that the cubic centimeter and the gram bear to each other the same relation as our dram for solids and the dram for fluids, or as the minim and the grain. The following table will prove to be sufficiently accurate for photographic purposes:

THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH MEASURE.

1	cubic centimeter	=	17	minims.							
2	cubic centimeters	=	34	"							
3	"	=	51	"							
4	"	=	68	"	or	1	dram	8	minims.		
5	"	=	85	"	"	1	"	25	"		
6	"	=	102	"	"	1	"	42	"		
7	"	=	119	"	"	1	"	59	"		
8	"	=	136	"	"	2	drams	16	"		
9	"	=	153	"	"	2	"	33	"		
10	"	=	170	"	"	2	"	50	"		
20	"	=	340	"	"	5	"	40	"		
30	"	=	510	"	"	1	ounce	0	dram	30	minims.
40	"	=	680	"	"	1	"	3	drams	20	"
50	"	=	850	"	"	1	"	6	"	10	"
60	"	=	1020	"	"	2	ounces	1	"	0	"
70	"	=	1190	"	"	2	"	3	"	50	"
80	"	=	1360	"	"	2	"	6	"	40	"
90	"	=	1530	"	"	3	"	1	"	30	"
100	"	=	1700	"	"	3	"	4	"	20	"
1000	"	=	1 litre = 34 fluid ounces nearly, or $2\frac{1}{8}$ pints.								

THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH WEIGHT.

ALTHOUGH a gram is equal to 15·4346 grains, the decimal is one which can never be used by photographers; hence in the following table it is assumed to be $15\frac{2}{5}$ grains, which is the nearest approach that can be made to *practical* accuracy:

1	gram	=	$15\frac{2}{5}$	grains.					
2	grams	=	$30\frac{4}{5}$	"					
3	"	=	$46\frac{1}{5}$	"					
4	"	=	$61\frac{3}{5}$	"	.... or	1	dram	$1\frac{2}{5}$	grain.
5	"	=	77	"	.... "	1	"	17	grains.
6	"	=	$92\frac{2}{5}$	"	.... "	1	"	$32\frac{2}{5}$	"
7	"	=	$107\frac{4}{5}$	"	.... "	1	"	$47\frac{4}{5}$	"
8	"	=	$123\frac{1}{5}$	"	.... "	2	drams	$3\frac{1}{5}$	"
9	"	=	$138\frac{3}{5}$	"	.... "	2	"	$18\frac{3}{5}$	"
10	"	=	154	"	.... "	2	"	34	"
11	"	=	$169\frac{2}{5}$	"	.... "	2	"	$49\frac{2}{5}$	"
12	"	=	$184\frac{4}{5}$	"	.... "	3	"	$4\frac{4}{5}$	"
13	"	=	$200\frac{1}{5}$	"	.... "	3	"	$20\frac{1}{5}$	"
14	"	=	$215\frac{3}{5}$	"	.... "	3	"	$35\frac{3}{5}$	"
15	"	=	231	"	.... "	3	"	51	"
16	"	=	$246\frac{2}{5}$	"	.... "	4	"	$6\frac{2}{5}$	"
17	"	=	$261\frac{4}{5}$	"	.... "	4	"	$21\frac{4}{5}$	"
18	"	=	$277\frac{1}{5}$	"	.... "	4	"	$37\frac{1}{5}$	"
19	"	=	$292\frac{3}{5}$	"	.... "	4	"	$52\frac{3}{5}$	"
20	"	=	308	"	.... "	5	"	8	"
30	"	=	462	"	.... "	7	"	42	"
40	"	=	616	"	.... "	10	"	16	"
50	"	=	770	"	.... "	12	"	50	"
60	"	=	924	"	.... "	15	"	24	"
70	"	=	1078	"	.... "	17	"	58	"
80	"	=	1232	"	.... "	20	"	32	"
90	"	=	1386	"	.... "	23	"	6	"
100	"	=	1540	"	.... "	25	"	40	"
1000	"	=	1 kilogram = 32 oz., 3 dr., 40 gr.						

METRIC SYSTEM OF WEIGHTS AND MEASURES.

MEASURES OF LENGTH.

Denominations and Values.		Equivalents in Use.	
Myriameter	10,000 meters.	6.2137	miles.
Kilometer	1,000 meters.	.62137	mile, or 3,280 ft. 10 ins.
Hectometer	100 meters.	328.	feet and 1 inch.
Dekameter	10 meters.	393.7	inches.
Meter	1 meter.	39.37	inches.
Decimeter	1-10th of a meter.	3.937	inches.
Centimeter	1-100th of a meter.	.3937	inch.
Millimeter	1-1000th of a meter.	.0394	inch.

MEASURES OF SURFACE.

Denominations and Values.		Equivalents in Use.	
Hectare	10,000 square meters.	2.471	acres.
Are	100 square meters.	119.6	square yards.
Centare	1 square meter.	1,550.	square inches.

MEASURES OF VOLUME.

Denominations and Values.			Equivalents in Use.			
Names.	No. of Liters.	Cubic Measures.	Dry Measure.		Wine Measure.	
Kiloliter or stere	1,000	1 cubic meter.	1.308	cubic yards.	264.17	gallons.
Hectoliter	100	1-10th cubic meter.	2	bu. and 3.35 pecks.	26.417	gallons.
Dekaliter	10	10 cubic decimeters.	9.08	quarts.	2.6417	gallons.
Liter	1	1 cubic decimeter.	.908	quart.	1 0567	quarts.
Deciliter	1-10	1-10th cubic decimeter.	6.1022	cubic inches.	.845	gill.
Centiliter	1-100	10 cubic centimeters.	.6102	cubic inch.	.338	fluid oz.
Milliliter	1-1000	1 cubic centimeter.	.061	cubic inch.	.27	fl. drm.

WEIGHTS.

Denominations and Values.			Equivalents in Use.	
Names.	Number of Grams.	Weight of Volume of Water at its Maximum Density.	Avoirdupois Weight.	
Millier or Tonneau	1,000,000	1 cubic meter.	2204.6	pounds.
Quintal	100,000	1 hectoliter.	220.46	pounds.
Myriagram	10,000	10 liters.	22.046	pounds.
Kilogram or Kilo	1,000	1 liter.	2.2046	pounds.
Hectogram	100	1 deciliter.	3.5274	ounces.
Dekagram	10	10 cubic centimeters.	.3527	ounce.
Gram	1	1 cubic centimeter.	15.432	grains.
Decigram	1-10	1-10th of a cubic centimeter.	1.5432	grain.
Centigram	1-100	10 cubic millimeters.	.1543	grain.
Milligram	1-1000	1 cubic millimeter.	.0154	grain.

For measuring surfaces, the square dekameter is used under the term of ARE; the hectare, or 100 ares, is equal to about two acres. *The unit of capacity* is the cubic decimeter or LITER, and the series of measures is formed in the same way as in the case of the table of lengths. The cubic meter is the unit of measure for solid bodies, and is termed STERE. *The unit of weight* is the GRAMME, which is the weight of one cubic centimeter of pure water weighed in a vacuum at the temperature of 4 deg. Cent. or 39.2 deg. Fahr., which is about its temperature of maximum density. In practice, the term cubic centimeter, abbreviated c.c., is used instead of milliliter, and cubic meter instead of kiloliter.

TABLE OF THE SYMBOLS, ATOMICITY, ATOMIC AND EQUIVALENT WEIGHTS OF THE ELEMENTS.

	Symbol and Atomic Value.	Atomic Weight.	Equivalent Weight.
Aluminium (Al_2^{vi})	Al^{iv}	27·5	9·13
Antimony (Sb''')	Sb^{v}	122	40·66
Arsenicum (As''')	As^{v}	75	25·0
Barium	Ba''	137	68·5
Beryllium, or Glucinum	Be''	9·5	4·7
Bismuth (Bi''')	Bi^{v}	208	69·33
Boron	B'''	11	3·66
Bromine	Br'	80	80·0
Cadmium	Cd''	112	56·0
Cæsium	Cs'	133	135·0
Calcium	Ca''	40	20·0
Carbon (C'')	C^{iv}	12	3·0
Cerium (Ce'')	Ce^{vi}	92	46·0
Chlorine	Cl'	35·5	35·5
Chromium Cr_2^{vi})	Cr^{vi}	52·5	26·1
Cobalt (Co'')	Co^{vi}	58·8	29·4
Copper	Cu''	63·5	63·4 31·7
Davyum	—	—	—
Decipium	—	—	—
Didymium	D''	96	47·5
Erbium (?)	Eb''	112·6	56·3
Fluorine	F'	19	19·0
Gallium	—	—	—
Gold	Au'''	196·7	65·33
Hydrogen	H'	1	1·
Indium	In^{vi}	75·6	37·8
Iodine	I'	127	127·0
Iridium	Ir^{iv}	107	49·5
Iron (Fe'' & Fe_2^{vi})	Fe^{vi}	56	28·0 18·66
Lanthanium	La'	92	46·4
Lavœsium	—	—	—
Lead (Pb'')	Pb^{iv}	207	103·5
Lithium	L'	7	7·0
Magnesium	Mg''	24	12·0
Manganese (Mn'' & Mn^{iv})	Mn^{vi}	55	27·5
Mercury	Hg''	200	200·0 100·0
Molybdenum	Mo^{vi}	96	45·4
Mosandeum	—	—	—
Nephmium	—	—	—
Nickel (Ni'')	Ni^{vi}	58·8	29·4
Niobium	Nb^{v}	97·6	18·8
Nitrogen (N' & N''')	N^{v}	14	4·66
Norwegium	—	—	—
Osmium	Os^{iv}	199	49·75

TABLE OF SYMBOLS, ETC.—*(Continued.)*

	Symbol and Atomic Value.	Atomic Weight.	Equivalent Weights.
Oxygen	O''	16	8·0
Palladium	Pd^{iv}	106·5	53·25
Phillipium	—	—	—
Phosphorus (P''')	P^{v}	31	10·33
Platinum	Pt^{iv}	198	98·7 49 35
Potassium (Kalium)	K'	39	39 1
Rhodium	Rh^{iv}	104·3	52·2
Rubidium	Rb'	85·3	85·4
Ruthenium	Ru^{iv}	104·2	26·0
Scandium	—	—	—
Selenium	Se^{vi}	79·5	39·7
Silicon (Silicium)	Si^{iv}	28	7·0
Silver	Ag'	108	108·0
Sodium (Natrium)	Na'	23	23·0
Strontium	Sr''	87·5	43·75
Sulphur S'' & S^{iv})	S^{vi}	32	16·
Tantalum	Ta^{v}	182	36·4
Tellurium	Te^{vi}	129	64·0
Terbium (?)	—	—	—
Thallium	Tl''	204	204·0
Thorinum (Thorium)	Th''	232	57·87
Tin (Sn'')	Sn^{iv}	118	59·0 29·5
Titanium	Ti^{iv}	50	12·5
Tungsten	W^{vi}	184	46·0
Uralium	—	—	—
Uranium	U^{vi}	120	60·
Vanadium	V^{v}	51·3	17·1
Yttirbium	—	—	—
Yttrium	Y''	61·7	30·85
Zinc	Zn''	65	32·6
Zirconium	Zr^{iv}	89·5	22·4

TABLE OF SYMBOLS, MOLECULAR WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

Abbreviations.—s., soluble; v. s., very soluble; sp. s., sparingly soluble; n.s., not soluble; dec., decomposed; del., deliquescent.

Name.	Symbol.	Mol. Weight.	One Part is Soluble in Cold Water	One Part is Soluble in Hot Water.	Alcohol.
Acid, Acetic, Glacial	$HC_2H_3O_2$	60	s.	s.	s.
" Boracic or Boric	H_3BO_3	62	30	3	1 in 30
" Carbolic (see Phenol)	HC_6H_6O	94	16·6	s.	s.
" Chlorhydric (see Hydrochloric)					
" Citric	$H_3C_6H_5O_7,H_2O$	210	·75	·5	10 in 15
" Digallic (see Tannic Acid)					
" Formic	H,CHO_2	46			
" Gallic	$HC_7H_5O_5$	170	100	3	1 in 8
" Hydrobromic	HBr	81			
" Hydriodic	HI	128			
" Hydrochloric	HCl	36·5			
" Hydrocyanic	HCy	27			
" Hydrosulphuric	H_2S	34			
" Muriatic (see Hydrochloric)					
" Nitric	HNO_3	63			
" Nitrous	HNO_2	47			
" Oxalic	$H_2C_2O_4, 2H_2O$	126	8	1	n. s.
" Pyrogallic (see Pyrogallol)	$H_3C_6H_3O_3$	126	3·5	1	v.s.& ether
" Salicylic	$HC_7H_5O_3$	138	760	9	v.s.& ether
" Sulphuric	H_2SO_4	98			
" Sulphurous	H_2SO_3	82		also in ether	
" Tannic (see Digallic Acid)	$H_4C_{27}H_{18}O_{17}$	618	·8	·5	10 in 8
" Tartaric	$H_4C_4H_2O_6$	150	·8	·5	1 in 5
Alcohol, Ethyl	C_2H_5OH	46			
" Methyl (see Wood Alcohol)	CH_3HO	32			
Alum (see Potassium Aluminium Sulphate)					

Alum Chrome (see Potassium Chromic Sulph.)					
Ammonia, Gaseous	H_3N	17	v. s.		
Ammonium, Bichromate	$(NH_4)_2Cr._2O_7$	253	v. s.	v. s.	
" Bromide	NH_4Br	98	1·5	1	1 in 13
" Carbonate (see Sal volatile)	$NH_4HCO_3 + NH_4CO_2NH_2$	175	4	dec.	sp. s.
" Chloride (see Sal ammoniac)	NH_4Cl	53·5	3	1	sp. s.
Ammonium Fluoride	NH_4F	37	v. s.	v. s.	sp. s.
" Iodide	NH_4I	145	1	·5	s.
" Nitrate	NH_4NO_3	80	2	1	s.
" Oxalate	$(NH_4)_2C_2O_4$	124	v. s.	v. s.	1:2
" Sulphide	NH_4HS	51	v. s.	v. s.	1:2
" Sulpho-cyanide	NH_4CNS	76	1	·5	s.
Barium, Bromide	$BaBr_2$	297	·90	·75	s.
" Chloride	$BaCl_2.2H_2O$	244	2·18	1·5	sp. s.
" Iodide	BaI_2	391	·48	·35	v. s.
" Per-oxide	BaO_2	169	n. s.	n. s.	in hdchl. acid
Bicarbonate of Potassa (see Potassium Bicarb).					
Bicarbonate of Soda (see Sodium Bicarbonate)					
Bichloride of Mercury (see Mercuric Chloride)					
Bromine	Br	79·8	s.	s.	s.
Borax (see Sodium Biborate)					
Cadmium, Bromide	$CdBr_2,4H_2O$	344	1·5	1	sp. s.
" Chloride	$CdCl_2$	183	·71	·67	sp. s.
" Iodide	CdI_2	366	1·5	1	1 in 2
Calcium, Bromide	$CaBr_2,4H_2O$	272	1	·75	s.
" Carbonate (see Chalk)	$CaCO_3$	100	n. s.	n. s.	n. s.
" Chloride	$CaCl_2$	111	·75	·5	1 in 10
" Hypochlorite (see Chloride of Lime)	$CaCl_2O_2CaCl_2$	254	sp. s.	sp.	dec.
" Iodide	CaI_2	294	·75	·5	1 in 10
Calomel (see Mercurous Chloride)					
Carbonate of Ammonia (see Ammonium Carb)					
Carbonate of Potash (see Potassium Carbonate)					
" of Soda (see Sodium Carbonate)					
Caustic Potash (see Potassium Hydrate)					
" Soda (see Sodium Hydrate)					

TABLE OF SYMBOLS, MOLECULAR WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

Abbreviations.—s., soluble; v. s., very soluble; sp. s., sparingly soluble; n. s., not soluble; dec., decomposed; del., deliquescent.

NAME.	SYMBOL.	MOL. WEIGHT.	ONE PART IS SOLUBLE IN COLD WATER	ONE PART IS SOLUBLE IN HOT WATER.	ALCOHOL.
Chalk (see Calcium Carbonate)					
Chloride of Lime (see Calcium Hypochlorite)					
Chlorine	Cl	35·4	1:2·5	Volumes.	
Chrome, Alum (see Potassium Chromic Sulph.)					
Copper Acetate (see Verdigris)	$Cu(C_3H_3O_2)_2,H_2O$	200	14	5	1 in 14
“ Bromide	$CuBr_2$	223·4	1	·75	s.
“ Chloride	$CuCl_2,H_2O$	170·5	1	·75	v. s.
“ Sulphate (see Blue Vitriol)	$CuSO_4.5H_2O$	249·2	3	1	n. s.
“ “ and Ammonia	$CuSO_4,4NH_3$	245·5	s.	v. s.	n. s.
Corrosive Sublimate (see Mercuric Chloride)					
Epsom Salts (see Magnesium Sulphate)					
Glaubers Salt (see Sodium Sulphate)					
Glycerine	$C_3H_5(HO)_3$	92	s.	s.	s.
Gold, Perchloride	$AuCl_3$	302·5	1	·75	also in ether
Green Vitriol (See Iron Sulphate)					
Hydrokinone	C_6H_42HO	110	3	s.	also in ether
Hydroxylamine Chloride	NH_3OHCl		v. s.	v. s.	n s.
Iodine	I	126.6	sp. s.	sp. s.	v. s.
Iron, Ammonium Sulphate	$FeSO_4(NH_4)_2SO_4+6H_2O$	392	v. s.	dec.	n. s.
“ Chloride (Ferric)	Fe_2Cl_6	325	·75	·5	1 in 1
“ “ (Ferrous)	$FeCl_2$	127	2	1	1 in 1
“ Citrate	$Fe_2(C_6H_5O_7)_2$	598	s.	s.	n. s.
“ Iodide	FeI_2	310	v. s.	v. s.	v. s.
“ Nitrate	$Fe(NO_3)_2, 6H_2O$	288	v. s.	dec.	dec.
“ Oxalate (Ferric)	$Fe_2(C_2O_4)_3$	376	s.	s.	n. s.
“ Oxalate (Ferrous)	FeC_2O_4	144	in potass-	ium oxal.	n. s.

Iron, Sulphate (Ferric)	$Fe_2(SO_4)_3$	400	s.	dec.	s.
" Sulphate (Ferrous)	$FeSO_4,7H_2O$	278	1·5	1	n. s.
Lead, Acetate (see Sugar of Lead)	$Pb.(C_2H_3O_2)_2.3H_2O$	379	2·5	2	1 in 12·5
" Carbonate	$(PbCO_3)Pb(HO)_2$	774	n. s.	sp. s.	n. s.
" Iodide	PbI_2	460	s.	s.	n. s.
" Nitrate	$Pb(NO_3)_2$	331	7·7	7	s.
" Oxide	PbO	223	n. s.	n. s.	Alkalis.
Lithium, Bromide	$LiBr$	87	·66	·5	v. s.
" Chloride	$LiCl$	42·5	1·3	1	s.
" Iodide	LiI	134	·61	·5	s.
Magnesium, Bromide	$MgBr_2$	184	1	·75	s.
" Chloride	$MgCl_2$	95	2	1·5	s.
" Iodide	MgI_2	278	1	·75	v. s.
" Sulphate (see Epsom Salt)	$MgSO_4, 7H_2O$	246	1·3	1	sp. s.
Mercury, Chloride (Mercuric) (see Corros. Subl)	$HgCl_2$	271	19	3	5
" " (Mercurous) (see Calomel)	Hg_2Cl	235·5	n. s.	n. s.	n. s.
" Cyanide	$HgCy_2$	252	8	2	1 in 20
" Iodide (Mercuric)	HgI_2	454	sp. s.	sp. s.	sp. s.
" " (Mercurous)	Hg_2I	327	n. s.	n. s.	n. s.
Phenol (see Carbolic Acid)					
Platinum Chloride	$PtCl_4$	339	1	·5	s.
Potassa (see Potassium Hydrate)					
Potassium, Aluminium Sulphate (see Alum)	$Al_2(SO_4)_3, K_2SO_4, 24H_2O$	948	10	8	n. s.
" Bicarbonate	$KHCO_3$	100	3	2	n. s.
" Bichromate	$K_2Cr_2O_7$	294·6	10	7	n. s.
" Bromide	KBr	119·1	2	1	1 in 90
" Carbonate	KO_2C_3	138·2	·75	·5	n. s.
" Chlorate	$KClO_3$	122·4	16	2	n. s.
" Chloride	KCl	74·5	3	2	sp. s.
" Chromic Sulph. (see Chrome Alum)	$Cr_2(SO_4)_3, K_2SO_4, 24H_2O$	999	10	dec.	n. s.
" Citrate	$K_3C_6H_5O_7H_2O$	324·3	·6	·3	n. s.
" Cyanide	KCy	65	1	·5	sp. s.
" Ferric Sulphate	$K_2SO_4.Fe_2(SO_4)_3, 24H_2O$	100·6	s.	s.	n. s.
" Ferri-cyanide (see Red Prussiate)	$K_6Fe_2C_{12}N_{12}$	658	2·5	1·2	n. s.
" Ferro-cyanide (see Yel. Pruss.)	$K_4FeC_6 3H_2O$	422	3	1	n. s.

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NAME.	SYMBOL.	MOL. WEIGHT.	ONE PART IS SOLUBLE IN COLD WATER	ONE PART IS SOLUBLE IN HOT WATER.	ALCOHOL.
Potassium, Fluoride	KFl	94	v. s.	v. s.	v. s.
" Hydrate	KOH	56·1	·5	·25	sp. s.
" Iodide	KI	166·1	·75	·5	1 in 16
" Nitrate (see Saltpetre)	KNO_3	101·1	4	1	n. s.
" Oxalate	$KC_2O_4H_2O$	235	3	2	sp. s.
" Permanganate	$K_2Mn_2O_8$	314	16	10	n. s.
" Platino-chloride	K_2PtCl_6	488·4	10	1	s.
" Sulpho-cyanide	KCyS	97	2	1	sp. s.
Prussiate of Potash, red (see Potassium Ferri-cyanide)					
Prussiate of Potash, yellow (see Potassium Ferro-cyanide)					
Pyrogallol (see Pyrogallic Acid)					
Sal ammoniac (see Ammonium Chloride)					
Sal soda (see Sodium Carbonate)					
Sal tartar (see Potassium Carbonate)					
Saleratus (see Potassium Bicarbonate)					
Sal volatile (see Ammonium Carbonate)					
Salt, common (see Sodium Chloride)					
Saltpetre (see Potassium Nitrate)					
Saltpetre of Chili (see Sodium Nitrate)					
Sesqui-Carbonate of Soda (see Sodium Carb).					
Silver, Acetate	$AgC_2H_3O_2$	167	sp.s.	sp. s.	n. s.
" Bromide	AgBr	188	n. s.	n. s.	in HCl and HBr.

Silver, Carbonate.	Ag_2CO_3	276	n. s.	n. s.	n. s.
" Chloride	$AgCl$	143·5	n. s.	n. s.	Ammonia, cyan. potass. hypo sulphite of soda.
" Citrate	$Ag_3C_6H_5O_7$	513	sp. s.	sp. s.	....
" Fluoride	$AgFl$	127	v. s.	v. s.	v. s.
" Iodide	AgI	235	n. s.	n. s.	same as Chloride.
" Nitrate	$AgNO_3$	170	1	·5	sp. s.
" Nitrite	$AgNO_2$	154	300	dec.	n. s.
" Oxalate	$Ag_2C_2O_4$	304	sp. s.	s.	n. s.
" Oxide	Ag_2O	232	n. s.	n. s.	n. s.
" Sulphide	Ag_2S	248	n. s.	n. s.	n. s.
Soda, Caustic (see Sodium Hydrate)	....	....	....	....	....
Sodium Acetate	$NaC_2H_3O_2, 6H_2O$	190	3	·66	n. s.
" Biborate (Borax)	$Na_2B_4O_7, 10H_2O$	382	12·5	2	n. s.
" Bromide	$NaBr$	103	1·25	1	1:16
" Bicarbonate	$NaHCO_3$	84	12	dec.	n. s.
" Carbonate	$Na_2CO_3, 10H_2O$	286	2	1	n. s.
" Chloride	$NaCl$	58·5	2·75	2·75	n. s.
" Citrate	$Na_3C_6H_5O_7$	258	1	·5	sp. s.
" Hydrate	$NaHO$	40	1·5	·5	sp. s.
" Hypo-sulphite	$Na_2S_2O_35H_2O$	248	1·5	1	sp. s.
" Iodide	NaI	150	·5	·3	sp. s.
" Nitrate (see Chili Saltpetre)	$NaNO_3$	85	1·36	1	1 in 37
" Sulph-antimonite	$NaSbS_3$	241	s.	s.	n. s.
" Sulphate	$Na_2SO_4, 10H_2O$	322	2	4	s.
" Sulphide	$Na_2S.9H_2O$	240	s.	s.	sp. s.
" Sulphite	$Na_2SO_3, 7H_2O$	252	4	2	sp. s.
" Thio-sulphate (see Hypo-sulphite)	....	....	....	....	....
Strontium, Bromide	$SrBr_2, 6H_2O$	355·5	1	·75	sp. s.
" Chloride	$SrCl_2, 6H_2O$	266·5	1·8	1	sp. s.
" Nitrate	$Sr(NO_3)_2$	211·5	5	2	sp. s.

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Abbreviations.—s., soluble; v.s., very soluble; sp.s., sparingly soluble; n.s., not soluble; dec., decomposed; del., delinquescent.

Name.	Symbol.	Mol. Weight.	One Part is Soluble in Cold Water	One Part is Soluble in Hot Water.	Alcohol.
Sugar of Lead (see Lead Acetate)					
Sulphate Soda (see Sodium Sulphate)					
Tannin (see Digallic Acid)					
Thymol	$C_6H_3(CH_3(C_3H_7)COO$	177	sp.		& in ether
Tin, Chloride (Stannic)	$SnCl_4$	260	dec.	in much	water.
" Chloride (Stannous)	$SnCl_2.2H_2O$	225	v. s.	v. s.	v. s.
Uranium, Bromide	$UBr_2.4H_2O$	352	1	·5	sp. s.
" Nitrate	$UO_2(NO_3)_2, 6H_2O$	384	·5	·25	v. s.
" Sulphate	$UO_2(SO_4),3H_2O$	302	·5	·25	v. s.
Verdigris (see Copper Acetate)					
Vitriol, Blue (see Copper Sulphate)					
" Green (see Iron Sulphate)					
" White (see Zinc Sulphate)					
Washing Soda (see Sodium Carbonate)					
Wood Alcohol (see Alcohol Methyl)					
Zinc, Bromide	$ZnBr_2$	225·2	1	·5	s.
" Chloride	$ZnCl_2$	136·2	·33		s.
" Iodide	ZnI_2	319·2	·33	dec.	v. s.
" Nitrate	$Zn(NO_3)_2,6H_2O$	189	del.	del.	del.
" Sulphate (see White Vitriol)	$ZnSo_4,7H_2O$	287	·7	·5	n. s.

IMPURITIES IN PHOTOGRAPHIC CHEMICALS AND TESTS FOR THEM.

SUBSTANCE.	IMPURITIES POSSIBLY PRESENT.	TESTS.
Ammonia	Carbonic Acid.	Renders lime-water milky.
	Dissolved solid matter	Residue left on evaporation.
	Chlorides.	After acidulating with nitric acid, it gives a precipitate with silver nitrate, which, after washing, is readily soluble in ammonia, and re-precipitated by nitric acid.
	Sulphates.	After acidulating with nitric acid, it gives a precipitate with barium nitrate.
	Lime.	A white precipitate with oxalate of ammonium.
	Lead is often present, derived from the action upon flint glass bottles.	Black precipitate with sulphuretted hydrogen.
Nitric Acid	Traces of sulphuric acid.	After dilution it gives a precipitate with barium nitrate.
	Chlorides.	After dilution it gives a precipitate with silver nitrate.
	Peroxide of nitrogen.	The acid is yellow.
	Iodine may be present if the acid be prepared from sodium nitrate.	After dilution and cooling it gives a blue color with starch paste or mucilage.
Hydrochloric Acid	Free chlorine.	Liberates iodine from solution of potassium iodide. See also chlorides, nitric acid.
	Sulphuric acid.	As above for nitric acid.
	Perchloride of iron.	Yellow color. Brown precipitate with ammonia added till it smells slightly.
Hydrochloric Acid	Arsenic.	Marsh's test.
	Some yellow samples contain no iron, but an organic salt, and give an alkaline ash on ignition of the residue after evaporation.	Reinsh's test; a small piece of copper foil becomes coated on boiling in dilute acid.
Sulphuric Acid	Bisulphate of potassium.	Residue on evaporation.
	Sulphate of lead.	Milkiness on dilution.
		May be completely freed from lead by diluting with three or four times as much water, and allowing to settle.
	When sold as pure, it invariably contains a trace of iron. Common acid is also liable to contain arsenic, selenium, thallium, and many other substances.	No easy test can be given, as the substances are so numerous; some of them volatile, and most require separation from the acid before detection.
	Organic matter, as a piece of straw in a carboy of acid.	Gives a brown color to the acid.
Acetic Acid	Water.	Does not solidify when cooled to 17° C, (53° F.)
	Sulphurous and hydrochloric acids.	White precipitate with silver nitrate.
	Aldehyde, or volatile tarry matter.	Blackens in the light after adding silver nitrate.
	Organic sulphuric acid.	Smell of garlic.
Citric Acid	Tartaric acid.	Strong solution of potassium acetate added to a strong solution of the acid will deposit white crystalline bitartrate.
Pyrogallic Acid	Metagallic acid.	Black residue insoluble in water.
Silver Nitrate	Free nitric acid.	Reddens litmus paper (neutral silver nitrate does not affect litmus).
Potassium Carbonate	Chlorides and sulphates.	Same as for ammonia.
Potassium Iodide	Potassium carbonate.	A strong solution is alkaline to test paper.
	Sulphates and chlorides.	Same as for ammonia.
	Potassium iodate.	A pretty strong solution becomes yellow from liberation of iodine on addition of dilute sulphuric acid, or better, a strong solution of citric acid.

ELSDEN'S TABLE OF POISONS AND ANTIDOTES.

	Poisons.	Remarks.	Characteristic Symptoms.	Antidote.
Vegetable Acids.	Oxalic Acid. including Potassium Oxalate.	1 dram is the smallest fatal dose known.	Hot, burning sensation in throat and stomach; vomiting, cramps, and numbness.	Chalk, whiting or magnesia, suspended in water. Plaster or mortar can be used in emergency.
Caustic Alkalies.	Ammonia. Potash. Soda.	Vapor of ammonia may cause inflammation of the lungs.	Swelling of tongue, mouth, and fauces; often followed by stricture of the œsophagus.	Vinegar and water.
Metallic Salts.	Mercuric Chloride.	3 grains the smallest known fatal dose.	Acrid, metallic taste, constriction and burning in throat and stomach, followed by nausea and vomiting.	White and yolk of raw eggs with milk. In emergency, flour paste may be used.
	Acetate of Lead.	The sub-acetate is still more poisonous.	Constriction in the throat and at pit of stomach; crampy pains and stiffness of abdomen; blue line round the gums.	Sulphates of soda or magnesia. Emetic of sulphate of zinc.
	Cyanide of Potassium.	*a.* Taken internally, 3 grs. fatal.	Insensibility, slow, gasping respiration, dilated pupils, and spasmodic closure of the jaws.	No certain remedy; cold affusion over the head and neck most efficacious.
		b. Applied to wounds and abrasures of the skin.	Smarting sensation.	Sulphate of iron should be applied immediately.
	Bichromate of Potassium	*a.* Taken internally.	Irritant pain in stomach, and vomiting.	Emetics and magnesia, or chalk.
		b. Applied to slight abrasions of the skin.	Produces troublesome sores and ulcers.	
	Nitrate of Silver.		Powerful irritant.	Common salt to be given immediately, followed by emetics.
Concentrated Mineral Acids.	Nitric Acid.	2 drams have been fatal. Inhalation of the fumes has also been fatal.	Corrosion of windpipe and violent inflammation.	Bicarbonate of soda, or carbonate of magnesia or chalk, plaster of the apartment beaten up in water.
	Hydrochloric Acid.	½ ounce has caused death.		
	Sulphuric Acid.	1 dram has been fatal.		
	Acetic Acid, concentrated, has as powerful an effect as the mineral acids.			
	Iodine.	Variable in its action; 3 grains have been fatal.	Acrid taste, tightness about the throat, vomiting.	Vomiting should be encouraged, and gruel, arrowroot and starch given freely.
	Ether.	When inhaled.	Effects similar to chloroform.	Cold affusion and artificial respiration.
	Pyrogallol.	2 grains sufficient to kill a dog.	Resemble phosphorus poisoning.	No certain remedy. Speedy emetic desirable.

ACKLAND'S TABLES FOR THE SIMPLIFICATION OF EMULSION CALCULATIONS.

No. 1.

	Equivalent weights.	Weight of $AgNO_3$ required to convert one grain of soluble haloid.	Weight of soluble haloid required to convert one grain $AgNO_3$.	Weight of silver haloid produced by one grain of soluble haloid.	Weight of soluble haloid required to produce one grain of silver haloid.	Weight of silver haloid produced from one grain $AgNO_3$.
Ammonium bromide.......	98	1.734	.576	1.918	.521	1.106
Potassium "	119.1	1.427	.700	1.578	.633	
Sodium "	103	1.650	.606	1.825	.548	
Cadmium " com. ..	172	.988	1.012	1.093	.915	
" " anh....	136	1.25	.800	1.382	.723	
Zinc "	112.1	1.509	.663	1.670	.600	
Ammonium chloride.......	53.5	3.177	.315	2.682	.373	.844
Sodium "	58.5	2.906	.344	2.453	.408	
Ammonium iodide.........	145	1.172	.853	1.620	.617	1.382
Potassium "	166.1	1.023	.977	1.415	.707	
Sodium "	150	1.133	.882	1.566	.638	
Cadmium "	183	.929	1.076	1.284	.778	

Table No. 1 presents the actual weights of haloid or silver, as the case may be, required to convert or combine with one grain of another.

In order to make (say) ten ounces of emulsion by a new formula, which, for the sake of showing the working of the table, we will write down as follows:

Bromide of potassium..........................	150 grains.
Iodide of potassium..	10 "
Chloride of ammonium..	10 "
Gelatine..	200 "

we want to know how much silver nitrate should be employed in sensitizing this mixture. For this purpose we use the first column, in which we find against each haloid the exact quantity of silver nitrate required to fully decompose one grain. Taking, then, the figures we find in column No. 1 against the three salts in the above formula, and multiplying them by the number of grains of each used, we have the following sum:

Potassium bromide......................	150 × 1.427 = 214	Weight silver nitrate required.
" iodide.......	10 × 1.023 = 10.23	
Chloride of ammonium.................	10 × 3.177 = 31.77	

or the total quantity of silver nitrate required for full conversion, 256.00 grains.

TABLE SHOWING COMPARATIVE VALUE OF ALKALINE CARBONATES IN DEVELOPERS.

O G. MASON, M.D.

COMMERCIAL NAME.	Chemical Symbol.	Molecular Weight.	The Commercial Salt contains of the pure Salt about	100 parts of 36 per cent Acetic Acid Require for Saturation.	Solubility in Water (approximate).
Soda, Caustic	NaHO	40	80 to 92%	26.66 p'rts of 90% Soda	1 part in 2
Sodium Carbonate, Carbonate of Soda, Sal Soda, Crystals,	$Na_2CO_3.10H_2O$	286	96 to 98%	89.38 " 96% "	1 " 2
The same, anhydrous or in dry powder	Na_2CO_3	106	About 98 to 99%	89.38 of 98 to 99% dry Sal Soda.	1 " 6
Sodium Bicarbonate, Bicarbonate of Soda, "Sesqui-carbonate of Soda,"	$NaHCO_3$	84	98 to 100%	50.91 of 99% Bicarb. Soda.	1 " 12

Equal work is done by 80 parts of Caustic Soda, 286 parts of Sal Soda (crystals), 106 parts of Sal Soda (dry), 168 parts of Bicarbonate of Soda. These quantities must be increased to make up for any impurity contained in the sample being used; for this purpose the usual percentage of impurity given in the above table may be assumed for all ordinary photographical uses.

Potassa (Caustic Potash)	KHO	56	80 to 95%	37.33 parts of 90% Potassa.	1 part in 1
Potassium Carbonate, Carbonate of Potassa, Sal Tartar, Saleratus,	$K_2CO_3.1\frac{1}{2}H_2O$	165	76 to 96% Usually about 81%	51.11 parts of 81% Carb. Potassa.	1 " 1
Potassium, Carbonate, dry	K_2CO_3	140	About 95%	122.74 parts of 95% Carb. Potassa.	1 " 1
Potassium Bicarbonate, Bicarbonate of Potassa,	$KHCO_3$	100	100%	60 parts of 100% Bicarb. Potassa.	1 " 4

Equal work is done by 112 parts Caustic Potassa, 165 parts (about) Carbonate Potassa, 200 parts of Bicarbonate Potassa. These quantities must be increased in proportion to impurities, as noted in case of Soda. These two alkalies are interchangeable for doing the same amount of work when *pure*, and when the one named in a given formula can not be obtained the table may assist in choosing a substitute of proper strength and solubility.

Dry or anhydrous Carbonate of Potassium is not usually found in the market.

TABLE SHOWING DISPLACEMENT ON GROUND GLASS OF OBJECTS IN MOTION.

By HENRY L. TOLMAN.

[Republished, with corrections, from the *Photographic Times.*]

LENS 6 IN EQUIV. FOCUS, GROUND GLASS AT PRINCIPAL FOCUS OF LENS.

Miles per Hour.	Feet per Second.	Distance on Ground Glass, in inches, with Object 30 Feet away.	Same with Object 60 Feet away.	Same with Object 120 Feet away.
1	1½	.29	.15	.073
2	3	.59	.29	.147
3	4½	.88	.44	.220
4	6	1.17	.59	.293
5	7½	1.47	.73	.367
6	9	1.76	.88	.440
7	10½	2.05	1·03	.513
8	12	2.35	1.17	.587
9	13	2.64	1.32	.660
10	14½	2.93	1.47	.733
11	16	3.23	1.61	.807
12	17½	3.52	1.76	.880
13	19	3.81	1.91	.953
14	20½	4.11	2.05	1.027
15	22	4.40	2.20	1.100
20	29	5.87	2.93	1.467
25	37	7.33	3.67	1.833
30	44	8.80	4.40	2.200
35	51	10.27	5.13	2.567
40	59	11.73	5.97	2·933
45	66	13.20	6.60	3.300
50	73	14.67	7.33	3.667
55	80	16.13	8.06	4.033
60	88	17.60	8.80	4.400
75	110	22.00	11.00	5.500
100	147	29.33	14.67	7.333
125	183	36.67	18.33	9.167
150	220	44.00	22.00	11.000

EQUATIONS RELATING TO FOCI.

The following simple optical formulas and calculations, worked out by Mr. J. A. C. Branfill, will prove useful in many branches of photography, especially where several lenses of varying foci are in constant use for a variety of purposes:

p = Principal focus.
F = Greater conjugate focus.
f = Lesser conjugate focus.
r = Ratio of any dimension in original to the same dimensions in copy (in case of reduction), or *vice versa* (in case of enlargement).
a = Diameter of aperture to lens.
x = Exposure required, assuming that $x = 1$ when $a = \frac{p}{4}$.

$$p = \frac{r(F+f)}{(r+1)^2}$$

$$f = p\left(\frac{1+r}{r}\right) = \frac{F+f}{r+1}$$

$$F = p(r+1) = rf$$

$$F+f = p \times \frac{(r+1)^2}{r} = p\left(2+r+\frac{1}{r}\right)$$

$$r = \frac{F-p}{p} = \frac{p}{f-p} = \frac{F}{f}$$

$$x = \frac{f^2}{16a^2}$$

N. B.—For ordinary landscape work, where r is greater than 20, x may be taken as $\frac{p^2}{16a^2}$

NOTE.—In case the above may not be clear to some photographers, the following rules may be better understood:

To find the principal focus of a lens (p), focus a near object in the camera, and measure the distance between it and the ground glass ($F+f$); next find the proportion which any dimension in the object bears to the same dimension on the ground glass (r). Thus, if the original dimension be four times as large as its reproduction, we say that r equals (=) 4. Multiply $F+f$ by r, and divide the product by the square of a number greater by one than r $(r+1)^2$. This rule was lately published by Mr. Debenham.

To find the lesser conjugate focus (f) (if p and r are known), multiply p by the sum of $r+1$ and divide the product by r. Or divide $F+f$ by $r+1$.

To find the greater conjugate focus (F) multiply p by $r+1$. Or multiply f by r.

To find $F+f$ (the distance which the ground glass should be from the object to be copied in order to get a given value for r) multiply p by the sum of $r+\frac{1}{r}+2$.

To find r divide $F-p$ (the difference between F and p) by p. Or divide p by $f-p$. Or divide F by f.

To find x divide the square of f by 16 times the square of a (the diameter of aperture to lens).

For example Focus an object which is five inches high, so that it is one inch high on the ground glass; thus we know that $r = 5$. Next measure the distance between the object and the ground glass ($F+f$), which is found to be 45 inches.

Then $p = 45 \times$ (multiplied by) $5 \div$ (divided by) $6 \times 6 = 6\frac{1}{4}$ inches.
$f = 6\frac{1}{4} \times 6 \div 5 = 7\frac{1}{2}$ inches. Or $f = 45 \div 6 = 7\frac{1}{2}$ inches.
$F = 6\frac{1}{4} \times 6 = 37\frac{1}{2}$ inches. Or $F = 7\frac{1}{2} \times 5 = 37\frac{1}{2}$ inches.
$F+f = 6\frac{1}{4} \times (5+\frac{1}{5}+2) = 6\frac{1}{4} \times 7\frac{1}{5} = 45$ inches.
$r = (37\frac{1}{2} - 6\frac{1}{4}) \div 6\frac{1}{4} = 5$. Or $r = 6\frac{1}{4} \div (7\frac{1}{2} - 6\frac{1}{4}) = 5$.

And x (the exposure required) will be $7\frac{1}{2} \times 8\frac{1}{2} \div (16 \times \frac{9}{16}) = 6\frac{1}{4}$; that is, the exposure will be $6\frac{1}{4}$ times as much as the exposure required with an aperture whose diameter equals $p \div 4$, assuming the aperture (a) to be $\frac{3}{4}$ inch diameter.

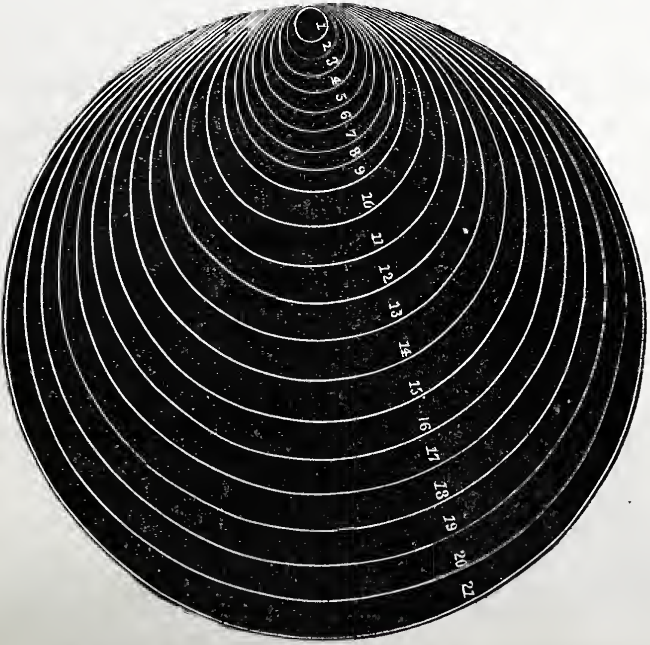
"UNIFORM SYSTEM" NUMBERS FOR STOPS FROM $\frac{f}{1}$ TO $\frac{f}{100}$.

In the following table Mr. S. A. Warburton has calculated the exposure necessary with every stop from $\frac{f}{1}$ to $\frac{f}{100}$ compared with the unit stop of the "uniform system" of the Photographic Society of Great Britain. The figures which are underlined show in the first column what $\frac{f}{a}$ must be in order to increase the exposure in geometrical ratio from $\frac{f}{4}$, the intermediate numbers showing the uniform system number for any other aperture.

f	U. S. No.
1	$\frac{1}{16}$
1¼	.097
1.414	⅛
1½	.140
1¾	.191
2	¼
2¼	.316
2½	.390
2.828	½
2¾	.472
3	.562
3¼	.660
3½	.765
3¾	.878
4	1.00
4¼	1.12
4½	1.26
4¾	1.41
5	1.56
5¼	1.72
5½	1.89
5.656	2
5¾	2.06
6	2.25
6¼	2.44
6½	2.64
6¾	2.84
7	3.06
7¼	3.28
7½	3.51
7¾	3.75
8	4
8¼	4.25
8½	4.51
8¾	4.78
9	5.06
9¼	5.34
9½	5.64
9¾	5.94
10	6.25
11	7.56
11.31	8
12	9.00
13	10.56
14	12.25
15	14.06
16	16
17	18.06
18	20.25
19	22.56
20	25.00
21	27.56
22	30.25
22.62	32
23	33.06
24	36.00
25	39.06
26	42.25
27	45.56
28	49.00
29	52.56
30	56.25
31	60.06
32	64
33	68.06
34	72.25
35	76.56
36	81.00
37	85.56
38	90.25
39	95.06
40	100.00
41	105.06
42	110.25
43	115.56
44	121.00
45	126.56
45.25	128
46	132.25
47	138.06
48	144.00
49	150.06
50	156.25
51	162.56
52	169.00
53	175.56
54	182.25
55	189.06
56	196.00
57	203.06
58	210.25
59	217.56
60	225.00
61	232.56
62	240.25
63	248.06
64	256
65	264.06
66	272.25
67	280.56
68	289.00
69	297.56
70	306.25
71	315.06
72	324.00
73	333.06
74	342.25
75	351.56
76	361.00
77	370.56
78	380.25
79	390.06
80	400.00
81	410.06
82	420.25
83	430.56
84	440.00
85	451.56
86	462.25
87	473.06
88	484.00
89	495.06
90	506.25
90.50	512
91	517.56
92	529.00
93	540.56
94	552.25
95	564.06
96	576.00
97	588.06
98	600.25
99	612.56
100	625.00

THE PHOTOGRAPHIC SOCIETY'S (OF GREAT BRITAIN) STANDARD DIAPHRAGMS.

The annexed diagram and table are intended to facilitate the calculation of the proper number with which to mark the diaphragms according to the Photographic Society of Great Britain's Uniform System, which will be found described on another page. This number it is proposed to call the "U. S." (or uniform system number). The numbered circles in the diagram represent the sizes of stops. The photographer, knowing the equivalent focus of his lens, looks along the line opposite the number which represents the circle nearest inside to his diaphragm, and when he gets to the column headed by that equivalent focus the number there found is the U. S. number to be marked on the diaphragm. For example: A lens of eight inches equivalent focus has a diaphragm in size about No. 5 on the diaphragm; running the eye along the line opposite No. 5 we find in the column under—"focus eight inches" the No. 11, which is the U. S. number required.



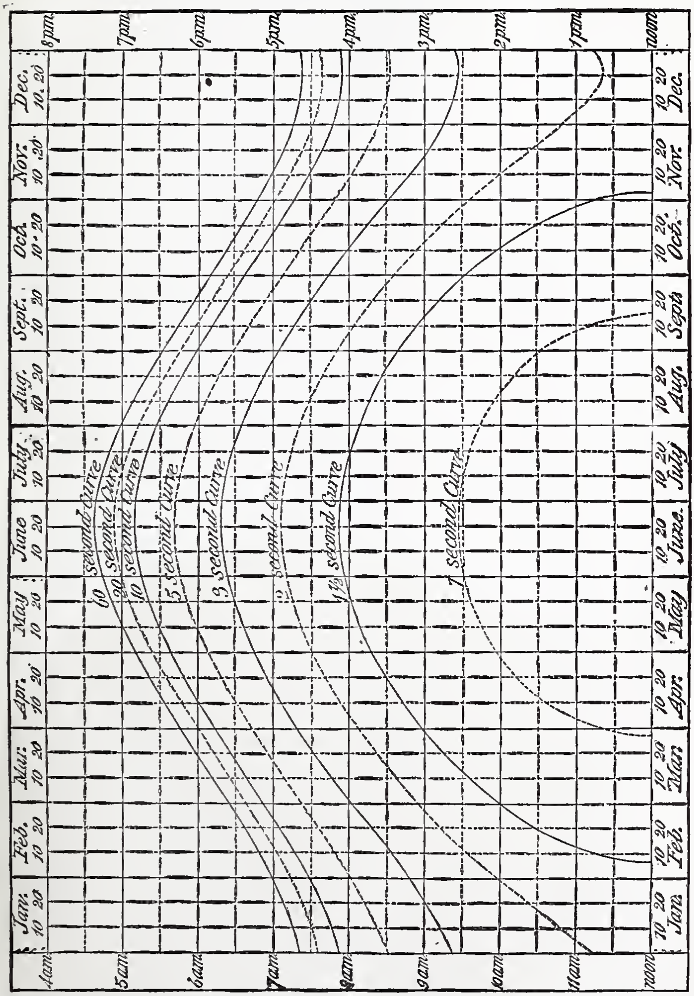
No. of Circle.	4 focus	5 focus	6 focus	7 focus	8 focus	9 focus	10 focus	12 focus	14 focus
1	25	39	56						
2	11	17	25	34	44	56	68		
3	6¼	10	14	19	25	31	40	56	
4	4	6¼	9	12	16	20	25	36	48
5	2¾	4¼	6¼	8½	11	14	17	25	34
6	2	3⅕	4½	6¼	8	10	13	18	25
7	1½	2⅓	3½	4¾	6	8	10	14	19
8	1¼	2	2¾	3¾	5	6¼	8	11	15
9	1	1½	2¼	3	4	5	6¼	9	12¼
10		1	1½	2⅛	2¾	3½	4⅓	6	8½
11			1¼	1½	2	2½	3⅕	5	6
12			⅞	1⅕	1½	2	2½	3½	4¾
13				1	1¼	1⅝	1⅔	2¾	4
14					1	1¼	1½	2¼	3
15						1	1⅓	1⅞	2½
16							1	1½	2
17								1⅓	$7\frac{2}{3}$
18								1⅙	1½
19								1	1⅓
20									1⅕
21									1

Note.—This table, taken from the "British Almanac," has proved to be very convenient in the calculating oɪ stop values.

DIAGRAM OF COMPARATIVE EXPOSURES.

Computed for the latitude of Washington, D. C. (38 deg., 54 min., N.)

By Lieut. Commander S. W. Very. U. S. N.



The straight lines in this diagram represent divisions of time; the vertical ones showing the month and day, and the horizontal ones the time of day as shown by a sun-dial.

The curved lines are curves of equal altitudes of the sun, computed for the latitude of Washington, for the year 1889.

The combination of the two systems of lines is designed to enable the Photographer, whether amateur or professional, who has at some time determined the length of exposure required under certain circumstances of subject, clouds, lens, diaphragm, plate or film, etc., to decide what exposure to give *under the same circumstances*, at any time between sunrise and sunset, on any day of the year.

The diagram is based upon one constructed for the latitude of London, published in the *Photographic News*, in 1887, and reprinted in the ANNUAL of 1888, and the same standard of comparison is used in this adaptation—that is, such circumstances of subject, clouds, lens, diaphragm, plate or film, etc., as will require an exposure of one second, at noon of any day between the 4th of April and the 7th of September, or at any time between a quarter to ten in the forenoon and a quarter past two in the afternoon of the 21st of June.

The diagram, although constructed for the year 1889, and for the latitude of Washington, will serve equally well for any other year, and well enough for ordinary purposes, throughout the United States, (exclusive of Alaska), although in the extreme Northern and Southern belts it will not be accurate.

The diagram is strictly accurate for "apparent time," only, but it is sufficiently so for "local mean time," (which may differ 16 minutes from "apparent time"), and in the great majority of places for "standard time," (which in some places differs half an hour from "mean time," and may differ three-quarters of an hour from "apparent time").

SAMUEL W. VERY, *Lieutenant Commander, U. S. Navy.*

TABLE FOR ENLARGEMENT AND REDUCTION

Computed for Centimeters or Inches.

Equivalent Focus of the Lens.	Distances of the Object and the Ground Glass Screen from the Center of the Objective.																								
	1 *t.*	2 *t.*	3 *t.*	4 *t.*	5 *t.*	6 *t.*	7 *t.*	8 *t.*	9 *t.*	10 *t.*	11 *t.*	12 *t.*	13 *t.*	14 *t.*	15 *t.*	16 *t.*	17 *t.*	18 *t.*	19 *t.*	20 *t.*	21 *t.*	22 *t.*	23 *t.*	24 *t.*	25 *t.*
5..	10 10	15 7.5	20 6.7	25 6.2	30 6	35 5.8	40 5.7	45 5.6	50 5.6	55 5.5	60 5.4	65 5.4	70 5.4	75 5.4	80 5.3	85 5.3	90 5.8	95 5.3	100 5.3	105 5.3	110 5.2	115 5.2	120 5.2	125 5.2	130 5.2
6..	12 12	18 9	24 8	30 7.5	36 7.2	42 7	48 6.9	54 6.8	60 6.7	66 6.6	72 6.5	78 6.5	84 6.4	90 6.4	92 6.4	102 6.4	108 6.4	114 6.3	120 6.3	126 6.3	132 6.3	138 6.3	144 6.3	150 6.3	156 6.2
7..	14 14	21 10.5	28 9.3	35 8.8	42 8.4	49 8.2	56 8	63 7.9	70 7.8	77 7.7	84 7.6	91 7.6	98 7.5	105 7.5	112 7.5	119 7.4	126 7.4	133 7.4	140 7.4	147 7.4	154 7.3	161 7.3	168 7.3	175 7.3	182 7.3
8..	16 16	24 12	32 10.7	40 10	48 9.6	56 9.3	64 9.1	72 9	80 8.8	88 8.8	96 8.7	104 8.7	112 8.6	120 8.6	128 8.5	136 8.5	144 8.5	152 8.4	160 8.4	168 8.4	176 8.4	184 8.4	192 8.3	200 8.3	208 8.3
9..	18 18	27 13.5	36 12	45 11.3	54 10.8	63 10.5	72 10.3	81 10.1	90 9.9	99 9.9	108 9.8	117 9.8	126 9.7	135 9.6	144 9.6	153 9.6	162 9.5	171 9.5	180 9.5	189 9.5	198 9.4	207 9.4	216 9.4	225 9.4	234 9.4
10..	20 20	30 15	40 13.3	50 12.5	60 12	70 11.7	80 11.4	90 11.3	100 11.1	110 11	120 10.9	130 10.8	140 10.8	150 10.7	160 10.7	170 10.6	180 10.6	190 10.6	200 10.5	210 10.5	220 10.5	230 10.5	240 10.4	250 10.4	260 10.4
11..	22 22	33 16.5	44 14.7	55 13.8	66 13.2	77 12.8	88 12.6	99 12.4	110 12.2	121 12.1	132 12	143 11.9	154 11.8	165 11.8	176 11.7	187 11.7	198 11.6	209 11.6	220 11.6	231 11.6	242 11.5	253 11.5	264 11.5	275 11.5	286 11.4
12..	24 24	36 18	48 16	60 15	72 14.4	84 14	96 13.7	108 13.5	120 13.3	132 13.2	144 13.1	156 13	168 12.9	180 12.9	192 12.8	204 12.7	216 12.7	228 12.7	240 12.6	252 12.6	264 12.6	276 12.5	288 12.5	300 12.5	312 12.5
13..	26 26	39 19.5	52 17.3	65 16.3	78 15.6	91 15.1	104 14.9	117 14.6	130 14·4	143 14.3	156 14.2	169 14.1	182 14	195 13.9	208 13.9	221 13.8	234 13.8	247 13.7	260 13.7	273 13.7	286 13.6	299 13.6	312 13.6	325 13.5	338 13.5
14..	28 28	42 21	56 18.7	70 17.5	84 16.8	98 16.3	112 16	126 15.8	140 15.6	154 15.4	168 15.3	182 15.2	196 15.1	210 15	224 14.9	238 14.9	252 14.8	266 14.8	280 14.7	294 14.7	308 14.7	322 14.6	336 14.6	350 14.6	364 14.6
15..	30 30	45 22.5	60 20	75 18.8	90 18	105 17.5	120 17.1	135 16.9	150 16.7	165 16.5	180 16.4	195 16.3	210 16.2	225 16.1	240 16	255 15.9	270 15.9	285 15.8	300 15.8	315 15.8	330 15.7	345 15.7	360 15.7	375 15.6	390 15.6

16..	32 32	48 24	64 21.3	80 20	96 19.2	112 18.7	128 18.8	144 18	160 17.8	176 17.6	192 17.5	208 17.3	224 17.2	240 17.1	256 17.1	272 16.9	288 16.9	304 16.9	320 16.8	336 16.8	352 16.8	368 16.7	384 16.7	400 16.7	416 16.6
17..	34 34	51 25.5	68 22.7	85 21.3	102 20.4	119 19.8	136 19.4	153 19.1	170 18.9	187 18.7	204 18.5	221 18.4	238 18.3	255 18.2	272 18.1	289 18.1	306 18	323 17.9	340 17.9	357 17.9	374 17.8	391 17.8	408 17.7	425 17.7	442 17.7
18..	36 36	54 27	72 24	90 22.5	108 21.6	126 21	144 20.6	162 20.3	180 20	198 19.8	216 19.6	234 19.5	252 19.4	270 19.3	288 19.2	306 19.1	324 19.1	342 19	360 18.9	378 18.9	396 18.8	414 18.8	432 18.8	450 18.8	468 18.7
19..	38 38	57 28.5	76 25.3	95 23.8	114 22.8	133 22.2	152 21.7	171 21.4	190 21.1	209 20.9	228 20.7	247 20.6	266 20.5	285 20.4	304 20.3	323 20.2	342 20.1	361 20.1	380 20	399 20	418 19.9	437 19.8	456 19.8	475 19.8	494 19.8
20..	40 40	60 30	80 26.6	100 25	120 24	140 23.3	160 22.9	180 22.5	200 22.2	220 22	240 21.8	260 21.7	280 21.5	300 21.4	320 21.3	340 21.3	360 21.2	380 21.2	400 21.1	420 21	440 21	460 20.9	480 20.9	500 20.8	520 20.8
21..	42 42	63 31.5	84 28	105 26.3	126 25.2	147 24.5	168 24	189 23.7	210 23.3	231 23.1	252 22.9	273 22.8	294 22.6	315 22.5	336 22.4	357 22.3	378 22.2	399 22.2	420 22.1	441 22.1	462 22	483 21.9	504 21.9	525 21.9	546 21.8
22..	44 44	66 33	88 29.3	110 27.5	132 26.4	154 25.7	176 25.1	198 24.8	220 24.4	242 24.2	264 24	286 23.8	308 23.7	330 23.6	352 23.5	374 23.4	396 23.2	418 23.2	440 23.2	462 23.1	484 23	506 23	528 23	550 22.9	572 22.1
23..	46 46	69 34.5	92 30.7	115 28.8	138 27.6	161 26.7	184 26.3	207 25.9	230 25.6	253 25.3	276 25.1	299 24.9	322 24.8	345 24.6	368 24.5	391 24.4	414 24.3	437 24.3	460 24.2	483 24.2	506 24.1	529 24	552 24	575 24	598 23.9
24..	48 48	72 36	96 32	120 30	144 28.8	168 28	192 27.4	216 27	240 26.7	264 26.4	288 26.2	312 26	336 25.8	360 25.7	384 25.6	408 25.5	432 25.4	456 25.3	480 25.3	504 25.2	528 25.1	552 25.1	576 25	600 25	624 25
25..	50 50	75 37.5	100 33.3	125 31.3	150 30	175 29.2	200 28.6	225 28.1	250 27.8	275 27.5	300 27.3	325 27.1	350 26.9	375 26.8	400 26.7	425 26.6	450 26.5	475 26.4	500 26.3	525 26.3	550 26.2	575 26.1	600 26.1	625 26	650 26

The use of the above table will best be explained by illustrations:

To enlarge six times with a lens of 15 centimeters (or inches) focal length. We find in the table under 6 *t.* and opposite the figures $\frac{105}{17.5}$, hence the object must be 17.5, and the screen 105 centimeters (or inches) from the centre of the lens.

To reduce eight times with a lens of 19 centimeters (or inches) focus, the object must be 171 and the screen 21.4 centimeters (or inches) from centre of lens.

The table can be formulated thus: Where p = focal length of lens, a = distance from ground-glass to centre of lens and b = distance from object to centre of lens, then $\frac{1}{a} + \frac{1}{b} = \frac{1}{p}$

PROF. BURTON'S TABLE OF COMPARATIVE EXPOSURES.

Apertures Calculated on the Standard System of the Photographic Society.	Sea and Sky.	Open Land-scape.	Landscape with heavy foliage in foreground.	Under Trees, up to		Fairly Lighted Interiors.		Badly Lighted Interiors, up to		Portraits in bright diffused Light out of doors.	Portraits in good Studio Light.		Portraits in Ordinary Room.	
				mins.	secs.	mins.	secs.	hrs.	mins.		mins.	secs.	mins.	secs.
No. 1, or $\frac{f}{4}$	$\frac{1}{160}$ sec.	$\frac{1}{50}$ sec.	$\frac{1}{8}$ sec.	0	10	0	10	0	2	$\frac{1}{6}$ sec.	0	1	0	4
No. 2, or $\frac{f}{5.657}$	$\frac{1}{80}$ sec.	$\frac{1}{25}$ sec.	$\frac{1}{4}$ sec.	0	20	0	20	0	4	$\frac{1}{3}$ sec.	0	2	0	8
No. 4, or $\frac{f}{8}$	$\frac{1}{40}$ sec.	$\frac{1}{12}$ sec.	$\frac{1}{2}$ sec.	0	40	0	40	0	8	$\frac{2}{3}$ sec.	0	4	0	16
No. 8, or $\frac{f}{11.314}$	$\frac{1}{20}$ sec.	$\frac{1}{6}$ sec.	1 sec.	1	20	1	20	0	16	$1\frac{1}{3}$ sec.	0	8	0	32
No. 16, or $\frac{f}{16}$	$\frac{1}{10}$ sec.	$\frac{1}{3}$ sec.	2 secs.	2	40	2	40	0	32	$2\frac{2}{3}$ secs.	0	16	1	4
No. 32, or $\frac{f}{22.627}$	$\frac{1}{5}$ sec.	$\frac{2}{3}$ sec.	4 secs.	5	20	5	20	1	4	$5\frac{1}{3}$ secs.	0	32	2	8
No. 64, or $\frac{f}{32}$	$\frac{2}{5}$ sec.	$1\frac{1}{3}$ sec.	8 secs.	10	40	10	40	2	8	$10\frac{2}{3}$ secs.	1	4	4	16
No. 128, or $\frac{f}{45.255}$	$\frac{4}{5}$ sec.	$2\frac{2}{3}$ secs.	16 secs.	21	20	21	20	4	16	21 secs.	2	8	8	32
No. 256, or $\frac{f}{64}$	$1\frac{3}{5}$ sec.	$5\frac{1}{3}$ secs.	32 secs.	42	40	42	40	8	32	42 secs.	4	16	17	4

CONVERSION OF FRENCH BAROMETER MEASUREMENTS INTO ENGLISH.

M. M.	Inches.	M. M.	Inches.	M. M.	Inches.	M. M.	Inches.	M. M.	Inches.	M. M.	Inches.
		640	**25.197**			**700**	**27.560**			**760**	**29.922**
39—	—25.158	41—	—25.237	99—	—27.520	1—	—27.599	59—	—29.882	61—	—29.961
38..	..25.119	42..	..25.276	98..	..27.481	2..	..27.638	58..	..29.843	**762**	**30**
37—	—25.079	43—	—25.315	97—	—27.441	3—	—27.678	57—	—29.804	63—	—30.040
36..	..25.040	44..	..25.355	96..	..27.402	4..	..27.717	56..	..29.764	64..	..30.079
35—	—25.000	45—	—25.394	95—	—27.363	5—	—27.756	55—	—29.725	65—	—30.119
34..	..24.961	46..	..25.433	94..	..27.323	6..	..27.796	54..	..29.686	66..	..30.158
33—	—24.922	47—	—25.473	93—	—27.284	7—	—27.835	53—	—29.646	67—	—30.197
32..	..24.882	48..	..25.512	92..	..27.245	8..	..27.875	52..	..29.607	68..	..30.237
31—	—24.843	49—	—25.552	91—	—27.205	9—	—27.914	51—	—29.567	69—	—30.276
630	**24.804**	**650**	**25.591**	**690**	**27.166**	**710**	**27.953**	**750**	**29.528**	**770**	**30.316**
29—	—24.764	51—	—25.630	89—	—27.126	11—	..28.993	49—	—29.489	71—	—30.355
28..	..24.725	52..	..25.670	88..	..27.087	12..	—28.032	48..	..29.449	72..	..30.394
27—	..24.685	53—	—25.709	87—	—27.048	13—	..28.071	47—	—29.410	73—	—30.434
26..	—24.646	54..	..25.748	86..	..27.008	14..	—28.111	46..	..29.371	74..	..30.473
25—	..24.607	55—	—25.788	85—	—26.969	15—	..28.150	45—	—29.331	75—	—30.512
24..	—24.567	56..	..25.827	84..	..26.930	16..	—28.189	44..	..29.292	76..	..30.552
23—	..24.528	57—	—25.868	83—	—26.890	17—	. 28.229	43—	—29.252	77—	—30.591
22..	—24.489	58..	..25.906	82..	..26.851	18..	—28.268	42..	..29.213	78..	..30.630
21—	..24.449	59—	—25.945	81—	—26.812	19—	..28.308	41—	—29.174	79—	—30.670
620	**24.410**	**660**	**25.985**	**680**	**26.772**	**720**	**28.347**	**740**	**29.134**	**780**	**30.709**
19..	24.370	61—	—26.024	79—	..26.733	21—	—28.386	39—	—29.095	81—	—30.749
18—	24.331	62..	..26.063	78..	—26.693	22..	..28.426	38..	..29.056	82..	..30.788
17..	24.292	63—	—26.103	77—	..26.654	23—	—28.465	37—	—29.016	83—	—30.827
16—	24.252	64..	..26.142	76..	—26.615	24..	..28.504	36..	..28.977	84..	..30.867
15..	24.213	65—	—26.182	75—	..26.575	25—	—28.544	35—	—28.938	85—	—30.906
14—	24.174	66..	..26.221	74..	—26.536	26..	..28.583	34..	..28.898	86..	..30.945
13..	24.134	67—	—26.260	73—	..26.497	27—	—28.623	33—	—28.859	87—	—30.985
12—	24.095	68..	..26.300	72..	—26.457	28..	..28.662	32..	..28.819	88..	..31.024
11..	24.056	69—	—26.339	71—	..26.418	29—	—28.701	31—	—28.780	89—	—31.063
610	**24.016**			**670**	**26.378**			**730**	**28.741**	**790**	**31.103**
Read up.		Read down.		Read up.		Read down.		Read up.		Read down.	

THERMOMETER SCALES.

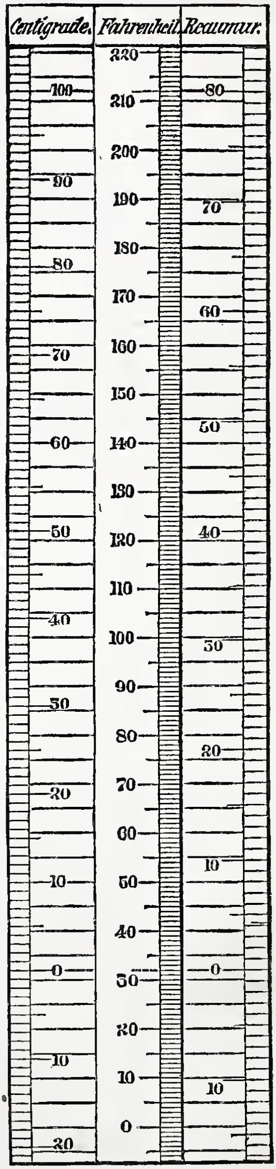


TABLE SHOWING THE COMPARISON OF THE READINGS OF THERMOMETERS.

CELSIUS, OR CENTIGRADE (C). RÉAUMUR (R). FAHRENHEIT (F).

C.	R.	F.	C.	R.	F.
—30	—24.0	—22.0	23	18.4	73.4
—25	—20.0	—13.0	24	19.2	75.2
—20	—16.0	— 4.0	25	20.0	77.0
—15	—12.0	+ 5 0	26	20.8	78.8
—10	— 8.0	14.0	27	21.6	80.6
— 5	— 4.0	23.0	28	22.4	82 4
— 4	— 3.2	24.8	29	23 2	84.2
— 3	— 2.4	26.6	30	24.0	86.0
— 2	— 1.6	28.4	31	24.8	87.8
— 1	— 0.8	30.2	32	25.6	89.6
			33	26.4	91.4
Freezing point of water.			34	27.2	93.2
			35	28.0	95.0
0	0.0	32.0	36	28.8	96.8
1	0.8	33.8	37	29.6	98.6
2	1.6	35.6	38	30.4	100.4
3	2.4	37.4	39	31.2	102.2
4	3.2	39.2	40	32.0	104.0
5	4.0	41.0	41	32.8	105.8
6	4.8	42.8	42	33.6	107.6
7	5.6	44.6	43	34.4	109.4
8	6.4	46.4	44	35.2	111.2
9	7 2	48.2	45	36.0	113.0
10	8.0	50.0	50	40.0	122.0
11	8.8	51.8	55	44.0	131.0
12	9.6	53.6	60	48.0	140.0
13	10.4	55.4	65	52.0	149.0
14	11.2	57.2	70	56.0	158.0
15	12.0	59.0	75	60.0	167.0
16	12.8	60 8	80	64 0	176.0
17	13.6	62.6	85	68.0	185.0
18	14.4	64.4	90	72.0	194.0
19	15.2	66.2	95	76.0	203.0
20	16.0	68.0	100	80.0	212.0
21	16.8	69.8			
22	17.6	71.6	Freezing point of water.		

Readings on one scale can be changed into another by the following formulæ, in which t° indicates degrees of temperature:

Réau. to Fahr.

$$\frac{9}{4}t^\circ \text{R} + 32^\circ = t^\circ \text{F}$$

Réau. to Cent.

$$\frac{5}{4}t^\circ \text{R} = t^\circ \text{C}$$

Cent. to Fahr.

$$\frac{9}{5}t^\circ \text{C} + 32^\circ = t^\circ \text{F}$$

Cent. to Réau.

$$\frac{4}{5}t^\circ \text{C} = t^\circ \text{R}$$

Fahr. to Cent.

$$\frac{5}{9}\left(t^\circ \text{F} - 32^\circ\right) = t^\circ \text{C}$$

Fahr. to Réau.

$$\frac{4}{9}\left(t^\circ \text{F} - 32\right) = t^\circ \text{R}$$

USUAL SIZES OF FRENCH AND ITALIAN DRY PLATES.

French.	*Inches.*	Italian.	*Inches.*
6½x 9 Centimetres	2.5x 3.6	9x12 Centimetres	3.6x 4.7
9 x12 "	3.6x 4.7	12x16 "	4.7x 6.3
12 x15 "	4.7x 5.9	12x18 "	4.7x 7.2
13 x18 "	5.1x 7.0	13x18 "	5.1x 7.0
12 x20 "	4.7x 7.8	12x20 "	4.7x 7.8
15 x21 "	5.9x 8.2	18x24 "	7.0x 9.4
15 x22 "	5.9x 8.6	21x27 "	8.2x10.6
18 x24 "	7.2x 9.4	24x30 "	9.4x11.8
21 x27 "	8.2x10.6	27x33 "	10.6x12.9
24 x30 "	9.4x11.8	30x36 "	11.8x14.1
27 x33 "	10.6x12.9	40x50 "	15.7x19.6
27 x35 "	10.6x13.7	50x60 "	19.6x23.6
30 x40 "	11.8x15.7		
40 x50 "	15.7x19.6		
50 x60 "	19.6x23.6		

SIZES OF GLASS, MOUNTS, PAPER, ETC.

Petite cards	1⅝x3⅛
One-ninth plate	2 x2½
One-sixth plate	2¾x3¼
One-fourth plate	3¼x4¼
Half plate	4½x6½ and 4¼x6½
Half plate (English)	4¾x6½
Whole plate (4–4)	6½x8½
Extra 4–4	8 x10

Other sizes are expressed by inches.

Sizes of Mounts.

Stereoscopic		3½x7, 4x7, 4¼x7, 4½x7, 5x8	
Victoria	3¼x5	Minette	1½x2⅜
Imperial	7⅞x9⅞	Card	2½x4⅛
Boudoir	5¼x8½	Cabinet	4¼x6½
Panel	4 x8¼	Promenade	4⅛x7⅛

Sizes of Albumen Paper.

18x22¾, 20½x24½, 22x36, 26x40, 27x42.

Size of blotting paper 19x24

FREEZING MIXTURES.

PARTS.	Reducing the Temperature	From Degrees of the Celsius	To Thermometer.
3	Nitrate of sodium + 4 Water	+13.2 deg.	— 5.3 deg.
9	Phosphate of sodium + 4 dilute Nitric acid	+10 "	— 9 "
3	Sulphate of sodium + 2 dilute Nitric acid	+10 "	—10 "
1	Nitrate of sodium + 4 Water		—10.6 "
1	Chloride of potassium + 4 Water		—11.8 "
5	Sal ammoniac + 5 Saltpetre + 16 Water	+10 deg.	—12 "
1	Nitrate of ammonia + 1 Water	+10 "	—15.5 "
8	Sulphate of sodium + 5 conc. Sulphuric acid	+10 "	—17 "
1	Sulphocyanate of Potass. + 1 Water	+18 "	—21 "
1	Chloride of sodium + 3 Snow		—21 "
1	Sal ammoniac + 1 Saltpetre + 1 Water	+ 8 deg.	—24 "
3	Crystal. chloride of calcium + 1 Snow		—36 "
1	Snow + 1 dilute Sulphuric acid	— 5 deg.	—41

AMERICAN, FRENCH, ENGLISH AND GERMAN MONEY.

American.	French.	English.	German.	American.	French.	English.	German.
dols. c.	*fr. c.*	*s. d.*	*m. pf.*	*dols. c.*	*fr. c.*	*s. d.*	*m. pf.*
0 01	0 05	0 0¼	0 04		2 87.5		2 30
0 02	0 10	0 1	0 08	0 56	2 92	2 4	
	0 12.5		0 10		**3 00**		**2 40**
0 03	0 15	0 1½	0 12	0 58	3 02	2 5	
	0 20		0 16	**0 60**	**3 12.5**	**2 6**	**2 50**
0 04	0 21	0 2		0 62	3 23	2 7	
	0 25		0 20		3 25		2 60
0 05	**0 26**	**0 2½**		0 64	3 33	2 8	
0 06	0 31	0 3	0 25		3 37.5		2 70
	0 37.5		0 30	0 66	3 44	2 9	
0 08	0 42	0 4			3 50		2 80
	0 50		0 40	0 68	3 54	2 10	
0 10	0 52	0 5			3 62.5		2 90
0 12	**0 62.5**	0 6	**0 50**	0 70	3 65	2 11	2 92
0 14	0 73	0 7		**0 72**	**3 75**	**3 0**	**3 00**
	0 75		0 60	0 74	3 85	3 1	3 08
0 16	0 83	0 8			3 87.5		3 10
	0 87.5		0 70	0 76	3 96	3 2	
0 18	0 94	0 9			**4 00**		**3 20**
	1 00		**0 80**	0 78	4 06	3 3	
0 20	1 04	0 10			4 12.5		3 30
	1 12.5		0 90	**0 80**	4 17	3 4	
0 22	1 15	0 11			4 25		3 40
0 24	**1 25**	**1 0**	**1 00**	0 82	4 27	3 5	
0 25	1 30	1 0½	1 04	**0 84**	**4 37.5**	**3 6**	**3 50**
0 26	1 35	1 1	1 08	0 86	4 48	3 7	
	1 37.5		1 10		4 50		3 60
0 28	1 46	1 2		0 88	4 58	3 8	
	1 50		1 20		4 62.5		3 70
0 30	1 56	1 3		0 90	4 69	3 9	
	1 62.5		1 30		4 75		3 80
0 32	1 67	1 4		0 92	4 79	3 10	
	1 75		1 40		4 87.5		3 90
0 34	1 77	1 5		0 94	4 90	3 11	
0 36	**1 87.5**	**1 6**	**1 50**	**0 96**	**5 00**	**4 0**	**4 00**
0 38	1 98	1 7		1 00	5 21	4 2	4 16
	2 00		1 60	1 20	6 25	5 0	5 00
0 40	2 08	1 8		1 44	7 50	6 0	6 00
	2 12.5		1 70	1 68	8 75	7 0	7 00
0 42	2 19	1 9		1 92	10 00	8 0	8 00
	2 25		1 80	2 16	11 25	9 0	9 00
0 44	2 29	1 10		2 40	12 50	10 0	10 00
	2 37.5		1 90	2 64	13 75	11 0	11 00
0 46	2 40	1 11	1 92	2 88	15 00	12 0	12 00
0 48	**2 50**	**2 0**	**2 00**	3 84	20 00	16 0	16 00
0 50	2 60	2 1	2 08	4 80	25 00	20=£1	20 00
	2 62.5		2 10	9 60	50 00	£2	40 00
0 52	2 71	2 2		14 40	75 00	£3	60 00
	2 5		2 20	19 20	100 00	£4	80 00
0 54	2 81	2 3		24 00	125 00	£5	100 00

STANDARD OF FOREIGN COINS FOR CUSTOMS PURPOSES

As Proclaimed by the Director of the Mint, January 1, 1888, and Corrected to Date.

The Value of Imports for the Assessment of Duties is ascertained by converting Currency of Invoice into Money of the United States, as per following Table:

Country.	Unit of Currency.	Sign.	Value in U. S. Cur.
Argentine Republic	Peso = 100 Centavos	$	.96,5
Austria	Florin = 100 Kreutzer	Fl.	.34,5
Azores.	Milreis = 1000 Reis	Rs. $	.83,5
Belgium	Franc = 100 Centimes	Frs.	.19,3
Bolivia	Boliviano = 10 Reales	$	.69,9
Brazil	Milreis = 1000 Reis	Rs. $	.54,6
British Possessions, N. A.	Dollar = 100 Cents	$	1.00
Chili	Peso = 100 Centavos	$	.91,2
China (*Haikwan*)	Tael = 10 Mace	Tael.	1.15,05
Cuba	Peso = 100 Centavos	$	.92,6
Denmark	Krone = 100 Ore	Kr.	.26,8
Ecuador	Sucre = 100 Centavos	$	.69,9
Egypt	Pound = 100 Piastres	£	4.94,3
France	Franc = 100 Centimes	Frs.	.19,3
Germany	Mark = 100 Pfennige	Mks.	.23,8
Great Britain	Pound Sterling = 20 Shillings	£	4.86,65
Greece.	Drachma = 100 Lepta	Dr.	.19,3
Guatemala	Peso = 100 Centavos	$	.69,9
Hayti.	Gourde = 100 Cents	$	.96,5
Honduras	Peso = 100 Centavos	$	.69,9
India	Rupee = 16 Annas	Rs.	.33,2
Italy	Lira = 100 Centesimi	L.	.19,3
Japan	Yen = 100 Sen Gold	Yen.	99,7
do	do = do Silver	Yen.	.75,3
Liberia	Dollar = 100 Cents	$	1.00
Mexico	Peso = 100 Centavos	$	.75,9
Netherlands	Florin = 100 Cents	Fl.	.40,2
Nicaragua	Peso = 100 Centavos	$	.69,9
Norway	Krone = 100 Ore	Kr.	.26,8
Paraguay	Peso = 100 Centavos	$	1.00
Peru	Sol = 100 Centavos	$	.69,9
Porto Rico	Peso = 100 Centavos	$	.92,5
Portugal	Milreis = 1000 Reis	Rs. $	1.08
Russia	Rouble = 100 Copecks	S. Ro.	.55,9
Sandwich Islands	Dollar = 100 Cents	$	1.00
Spain	Peseta = 100 Centimos	Ptas.	.19,3
do	Peso = 5 Pesetas	$	.96,5
Sweden	Krone = 100 Ore	Kr.	.26,8
Switzerland	Franc = 100 Centimes	Frs.	.19,3
Tripoli	Mahbub = 20 Piastres	$	.63
Tunis	Piastre = 16 Caroubs	Ptrs.	.11,8
Turkey	Piastre = 40 Paras	Ptrs.	.04,4
U. S. Columbia	Peso = 100 Centavos	$	.69,9
Uruguay	Patacon = 100 Centavos	$	.94,9
Venezuela	Bolivar = 100 Centimos	Brs.	.14

U. S. PATENT OFFICE PROCEDURE.

PATENTS are issued in the name of the United States, and under the seal of the Patent Office to any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned; and by any person who, by his own industry, genius, efforts, and expense, has invented and produced any new and original design for a manufacture, bust, statue, alto-relievo, or bas-relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics, any new and original impression, ornament, pattern, print, or picture to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture; or any new, useful, and original shape or configuration of any article of manufacture, the same not having been known nor used by others before his invention or production thereof, nor patented nor described in any printed publication, upon payment of the fees required by law and other due proceedings had.

Joint inventors are entitled to a joint patent; neither can claim one separately. Independent inventors of distinct and independent improvements in the same machine can not obtain a joint patent for their separate inventions; nor does the fact that one furnishes the capital and another makes the invention entitle them to make application as joint inventors; but in such case they may become joint patentees.

Every patent contains a grant to the patentee, his heirs or assigns, for the term of seventeen years, of the exclusive right to make, use, and vend the invention or discovery throughout the United States and the Territories, referring to the specification for the particulars thereof.

If it appear that the inventor, at the time of making his application, believed himself to be the first inventor or discoverer, a patent will not be refused on account of the invention or discovery, or any part thereof, having been known or used in any foreign country before his invention or discovery thereof, if it had not been before patented or described in any printed publication.

Letters Patent granted a foreign government will not while in force prevent the inventor from obtaining a patent in the United States, unless the invention shall have been introduced into public use into the United States more than two years prior to the application. But every patent granted for an invention which is the subject of Letters Patent still in force and previously granted to the same inventor in a foreign country will be so limited as to expire at the same time with such foreign patent, or, if there be more than one, at the same time with the one having the shortest unexpired term, but in no case will it be in force more than seventeen years.

APPLICATIONS.

Application for a patent must be made in writing to the Commissioner of Patents. The applicant must also file in the Patent Office a written description of the same, and of the manner and process of making, constructing, compounding, and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound and use the same; and in case of a machine, he must explain the principle thereof, and the best mode in which he has contemplated applying that principle, so as to distinguish it from other inventions, and particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery. The specification and claim must be signed by the inventor and attested by two witnesses.

The applicant shall make oath that he verily believes himself to be the original and first inventor or discoverer of the art, machine, manufacture, composition, or improvement for which he solicits a patent; that he does not know and does not believe the same was ever before known or used, and shall state of what country he is a citizen. Such oath may be made before any person within the United States authorized by law to adminster oaths, or, when the applicant resides in a foreign country, before any minister, charge d'affaires, consul, or commercial agent, holding commission under the Government of the United States, or before any notary public of the foreign country in which the applicant may be.

When the nature of the case admits of drawings, the applicant must furnish one copy signed by the inventor or his attorney in fact, and attested by two witnesses, to be filed in the Patent Office. In all cases which admit of representation by model, the applicant, if required by the commissioner, shall furnish a model of convenient size to exhibit advantageously the several parts of his invention or discovery.

On the filing of such application and the payment of the fee required by law, if on such examination, it appears that the claimant is justly entitled to a patent under the law, and that the same is sufficiently useful and important, the commissioner will issue a patent therefor.

Assignments.

Every patent or any interest therein shall be assignable in law by an instrument in writing; and the patentee or his assigns or legal representatives may, in like manner, grant and convey an exclusive right under his patent to the whole or any specified part of the United States.

Reissues.

A reissue is granted to the original patentee, his legal representatives, or the assignees of the entire interest when, by reason of a defective or insufficient specification, or by reason of the patentee claiming as his invention or discovery more than he had a right to claim as new, the original patent is inoperative or invalid, provided the error has arisen from inadvertence, accident, or mistake, and without any fraudulent or deceptive intention. The applications must be made and the specification sworn to by the inventors, if they be living.

Caveats.

A caveat under the patent law, is a notice given to the office of the caveator's claim as inventor, in order to prevent the grant of a patent to another for the same alleged invention upon an application filed during the life of the caveat without notice to the caveator.

Any citizen of the United States who has made a new invention or discovery, and desires further time to mature the same, may, on payment of a fee of ten dollars, file in the Patent Office a caveat setting forth the object and the distinguishing characteristics of the invention, and praying protection of his right until he shall have matured his invention. Such caveat shall be filed in the confidential archives of the office and preserved in secrecy, and shall be operative for the term of one year from the filing thereof.

An alien has the same privilege, if he has resided in the United States one year next preceding the filing of his caveat, and has made oath of his intention to become a citizen.

The caveat must comprise a specification, oath, and, when the nature of the case admits of it, a drawing, and, like the application, must be limited to a single invention or improvement.

FEES.

Fees must be paid in advance, and are as follows: On filing each original application for a patent, $15. On issuing each original patent, $20. In design cases: For three years and six months, $10; for seven years, $15; for fourteen years, $30. On filing each caveat, $10. On every application for the reissue of a patent, $30. On filing each disclaimer, $10. For certified copies of patents and other papers, including certified printed copies, ten cents per hundred words. For recording every assignment, agreement, power of attorney, or other paper, of three hundred words or under, $1; of over three hundred and under one thousand words, $2; of over one thousand words, $3. For copies of drawings, the reasonable cost of making them.

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ANY citizen of the United States, or resident therein, who is the author, inventor, designer, or proprietor of any book, map, chart, dramatic or musical composition, engraving, cut, PRINT, or PHOTOGRAPH, or NEGATIVE THEREOF, or of a painting, drawing, chromo, statue, statuary, and of models or designs intended to be perfected as works of the fine arts, and the executors, administrators, or assigns of any such person, may secure to himself the sole liberty of printing, publishing, completing, copying, and vending the same, and, if a dramatic composition, of publicly performing or representing it, or causing it to be performed or represented by others.

Every applicant for a copyright must state distinctly the name and residence of the claimant, and whether right is claimed as author, designer, or proprietor. No affidavit or formal application is required.

A *printed* copy of the title (besides the two copies to be deposited after publication) of the book, map, chart, dramatic or musical composition, engraving, cut, print, or photograph, or a *description* of the painting, drawing, chromo, statue, statuary, or model or design for a work of the fine arts, for which copyright is desired, must be sent by mail or otherwise, *prepaid*, addressed "LIBRARIAN OF CONGRESS, WASHINGTON, D. C." This must be done before publication of the book or other article.

The *printed title* required may be a copy of the title-page of such publications as have title-pages. In other cases, the title must be printed expressly for copyright entry, with name of claimant of copyright. The style of type is immaterial, and the print of a type-writer will be accepted. But a separate title is required for each entry, and *each* title must be printed on paper as large as commercial note. The title of a *periodical* must include the date and number.

FEES.

The legal fee for *recording* each copyright claim is 50 cents, and for a *copy* of this record (or certificate of copyright) an additional fee of 50 cents is required. Certificates covering more than one entry are not issued.

Within ten days after publication of each book or other article, two complete copies of the best edition issued must be sent, to perfect the copyright, with the address "LIBRARIAN OF CONGRESS, WASHINGTON, D. C." The postage must be prepaid, or else the publications enclosed in parcels covered by printed Penalty labels, furnished by the Librarian, in which case they will come FREE by mail without limit of weight, according to rulings of the Post Office Department. Without the deposit of copies above required the copyright is void, and a penalty of $25 is incurred. No copy is required to be deposited elsewhere.

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No copyright is valid unless notice is given by inserting in every copy published, on the title-page or the page following, if it be a book ; or, if a map, chart, musical composition, print, cut, engraving, photograph, painting, drawing, chromo, statue, statuary, or model or design intended to be perfected as a work of the fine arts, by inscribing upon some portion thereof, or on the substance on which the same is mounted, the following words, viz.: "*Entered according to act of Congress, in the year* ——, *by* ——, *in the office of the Librarian of Congress, at Washington,*" or, at the option of the person entering the copyright, the words : "*Copyright,* 18—, *by*——.'

The law imposes a penalty of $100 upon any person who has not obtained copyright who shall insert the notice "*Entered according to act of Congress,*" or "*Copyright,*" etc., or words of the same import, in or upon any book or other article.

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Duration of Copyright.

The original term of copyright runs for twenty-eight years. *Within six months before* the end of that time, the author or designer, or his widow or children, may secure a renewal for the further term of fourteen years, making forty-two years in all. Applications for renewal must be accompanied by explicit statement of ownership, in the case of the author, or of relationship, in the case of his heirs, and must state definitely the date and place of entry of the original copyright. Advertisement of renewal is to be made within two months of date of renewal certificate, in some newspaper, for four weeks.

Assignments.

A copyright is assignable in law by any instrument of writing, but such assignment must be recorded in the office of the Librarian of Congress within sixty days from its date. The fee for this record and certificate is one dollar, and for a certified copy of any record of assignment, one dollar.

Serials or Separate Publications.

In the case of books published in more than one volume, or of periodicals published in numbers, or of engravings, photographs, or other articles published with variations, a copyright is to be entered for each volume or part of a book, or number of a periodical, or variety, as to style, title, or inscription of any other article. But a book published serially in a periodical under the same general title, requires only one entry. To *complete* the copyright on such a work, two copies of each serial part, as well as of the complete work (if published separately), must be deposited.

Works of Art.

To secure a copyright for a painting, statue, or model or design intended to be perfected as a work of the fine arts, so as to prevent infringement by copying, engraving, or vending such design, a definite description must accompany the application for copyright, and a photograph of the same, at least as large as "cabinet size," should be mailed to the Librarian of Congress within ten days from the completion of the work or design.

Copyrights cannot be secured through the Librarian of Congress upon trade-marks, nor upon mere names of companies or articles, nor upon prints or labels intended to be used with any article of manufacture. If protection for such names or labels is desired, application must be made to the Patent Office, where they are registered at a fee of $6 for labels and $25 for trade-marks. Trade marks and labels are, however, protected without registration throughout most of the States.

RECORD OF PHOTOGRAPHIC PATENTS.

Issued by the United States Patent Office, from November 6, 1888, to October 1, 1889. with Names of Patentees.

Compiled by F. C. Beach.

292,194.—Fly Shutter for Photographic Camera.
Willard H. Fuller, Passaic, N. J.
392,292.—Photographic Exhibitor.
John J. Sloan, Chicago, Ill.
392,563.—Photographic Case.
Peter T. Kavanagh, Chicago, Ill.
393,500.—Camera Shutter.
Francis Burrows, Elizabeth, N. J.
393,642.—Vignetting Screen.
Harry B. Hansbury, Philadelphia, Pa.
393,696.—Photographic Camera.
Willard H. Fuller, Passaic, N. J.
393,729.—Camera.
Emanuel W. Sweigard, Oberlin, Pa.
394,221.—Photographic Apparatus.
Mathew J. Stevens, Chicago, Ill.
394,353.—Photographic Camera.
William G. Gibbs, Oakland, Cal.
394,437.—Photographing Copying Process.
Gustav Bay, Suresnes, near Paris, France.
394,498.—Photographic Exhibition.
Edward S. Miller, Chicago, Ill.
395,234.—Process of Making Pictures.
David Isaacson, Providence, R. I.
395,899.—Photographic Cameras,
Sidney P. Hasey, New York, N. Y.
396,428.—Automatic Photographic Apparatus,
Wm. R. Pope and Edward L. Poole, Baltimore, Md.
396,455.—Automatic Picture Exhibitor.
Conrad Bach, St. Galle, Switzerland.
396,536.—Album.
Robert Brown, Miamisburg, Ohio.
396,573.—Camera Carrying Case and Plate Changing Box.
James H. Johnson, San Francisco, Cal.
396,656.—Magazine Plate Holder for Photographic Plates.
Frederick A. Hetherington, Brooklyn, N. Y.

396,699.—Photographic Shutter.
Edmund Kuhn, New York, N. Y.
396,727.—Temporary Binder for Photographic Cards.
Irving H. Brown, New York, N. Y.
396,927.—Photographic Album.
E. H. Harrimann, Offenback on the Wein, Germany.
397,309.—Photographic Burnisher.
Silas H. Randall, Wyoming, Ohio.
397,428.—Photographic Camera.
John J. Higgins, New York, N. Y.
397,429.—Photographic Camera,
John J. Higgins, New York, N. Y.
397,480.—Process of ToningBlue Prints.
Harold Whiting, Cambridge, Mass.
398,084.—Magnesium Lighting Apparatus for Taking Photographic Pictures.
John W. C. C. Schirm, Breslau, Prussia, Germany.
398,231.—Photographic Camera,
Louis Chevallier, Brooklyn, N. Y.
398,712.—Photographic Chair.
Theodore Endrau, Cleveland, Ohio.
398,941.—Photographic Transparency and Printing Frame.
Cornelius T. Cain, Owensborough, Ky.
398,953.—Wall Case for Exhibiting Photographs.
Franklin, East Dundee, Scotland.
398,980.—Camera Shutter.
Wm. Shakespear, Jr. and Garrett W. Lowe, Kalamazoo, Mich.
399,324.—Album.
Owen E. Griffits, Chicago, Ill.
399,325.—Album.
Owen E. Griffits, Chicago, Ill.
399,345.—Camera Adjuster.
Henry E. Poehlmann, San Francisco Cal.
399,499.—Photographic Lens.
Alvan G. Clark, Cambridgeport, Mass.
399,553.—Automatic Picture Exhibiter.
C. E. Patterson, Newburgh, N. Y.
399,596.—Magic Lantern.
H. J. Brown, Brooklyn, N. Y.
399,756.—Vignette Holder.
A. L. Geer, Midland, Mich.
400,031.—Method of Mounting and Preserving Photograph Proofs and Copies.
Daniel K. Zumwolt, Viscala, Cal.
400,084.—Photographic Shutter.
Henry Herbert, London, County of Middlesex, England.
400,140.—Photographic Dark Room Lantern or Lamp.
Geo. W. Stockley, Cleveland, Ohio.
400,162.—Photographic Camera.
Erastus B. Barker, Newark, N. J.
401,083.—Vignetting Attachment for Photographic Printing Frames.
J. R. Tewksbury, Fort Madison, Iowa.
401,303.—Transparent Picture.
Wm. R. Read, Jr., Boston, Mass.
401,320.—Photographing Instrument.
Geo. A. Cook, Philadelphia, Pa.

401,441.—Method of Mounting Portraits.
Philip G. Cramer, Jr., Detroit, Mich.
401,510.—Translucent Film for the use in the art of Photo-Engraving.
Carl A. Miller, New York, N. Y.
401,771.—Apparatus for Coating Plates with Emulsion.
Robert E. M. Bain, St. Louis, Mo.
401,802.—Attachment for Photographic Camera.
Geo. D. Thompson, Lockland, Ohio.
401,807.—Stereoscope.
Hawley C. White, North Bennington, Vt.
401,946.—Photographic Camera. .
Eugene Hackh, New York, N. Y.
402,154.—Photographic Printing Frame.
Willard H. Fuller, Passaic, N. J.
402,214.—Photographic Plate Developing Trays.
Thomas S. Wiles, Albany, N. Y.
402,279.—Photographic Paper.
Frederick H. Rogers, Los Angeles, California.
402,512.—Photographic Plate Holding Apparatus.
Jacob P. Decker, New York, N. Y.
402,680.—Film Supporting Frame for Photo. Cameras.
Wm. H. Lewis. Brooklyn, N. Y.
402,711.—Photographic Camera.
Erastus B. Barker, Newark, N. J.
402,806.—Shutter for Photographic Camera.
Ralph D. Cleveland and Charles A. Hoffman, Minneapolis. Minn.
402,827.—Package for Photographic Plates.
DeWitt C. Hoover, Buffalo, N. Y.
402,961.—Photographic Plate Handle or Holder.
Wm. K. Moody, Boston, Mass.
403,061.—Process of Making Iron Prints by Photography.
Chas. R. McBlair and Alexander A. Raff, Washington, D. C.
403,476.—Photographic Apparatus.
Henry Kuhn, St. Louis, Mo.
403,574.—Photographic Camera.
Chas. E. Burlingam, Boston, Mass.
403,647.—Photographic Cabinet.
John Cornish, Boston, Mass.
403,887.—Picture Exhibitor.
Geo. D. Knipp, Stuttgart, Germany.
403,994.—Photographic Camera.
James H. Ford, New York, N. Y., and Max Jurnick, Jersey City, N. J
404,375.—Shutter for Photographic Camera.
Robert E. M. Bain, St. Louis, Mo.
404,396.—Camera Stand.
Willard H. Fuller, Passaic, N. J.
404,534.—Photographic Retouching Machine.
Laura O. Gervin and John Loff, Chicago, Ill.
404,605.—Rack for Washing and Drying Photographic Plates.
Walter S. Pullen, Kearney, N. J.
404,814.—Photograph Print Mounter.
John W. Aldridge, Waterbury, Conn.
405,130.—Mount for Photographs.
Richard H. L. Talcott, Boston, Mass.

405,321.—Coin Operating Stereoscope.
Clara F. Patterson, New York, N. Y.

405,454.—Roll Holder for Photographic Films.
Louis H. Bannister.

405,463.—Device for Setting or Cooling Photographic Emulsions.
James W. S. Cadett, Ashstead, County of Surrey, England.

405,758.—Camera Stand.
Frank G. Bement, N. Y.

406,085.—Photographic Plate Holder.
Geo. H. Carlisle, Detroit, Mich.

406,269.—Photographic Washing Apparatus.
James W. Dalrymple, Salesbury, Ind.

406,299.—Photographic Light Apparatus.
Lucien C. Overfleck, Hamilton, Ohio.

406,460.—Support for Photographic Films.
Ralph McNeil, New York, N. Y.

406,471.—Picture Exhibitor.
Jacob Reitz, New York, N. Y.

406,934.—Camera Attachment.
Orlo L. Munger, Gresham, Nebraska.

407,050.—Photographic Paper Roll-Holder.
Erastus B. Baker, New York, N. Y.

407,074.—Album.
C. Jaeger, New York, N. Y.

407,275.—Photographic Camera.
Erastus B. Baker, New York, N. Y.

407,351.—Compound for Producing Flash-Light.
A. Hemsley, Philadelphia, Pa.

407,587.—Photographic Camera.
Willard H. Fuller, Passaic, N. J.

407,647.—Photographic Roll-Holder.
Geo. Eastman, Rochester, N. Y.

407,728.—Photographic Portable Compartment for Transfering Plates.
Sidney Green, Brooklyn, N. Y.

408,451.—Roll-Holders for Photographic Cameras.
Erastus B. Barker, New York, N. Y.

408,596.—Camera.
Geo. Eastman, Rochester, N. Y.

409,507.—Stripped Negative.
Francois Schmalz, New York, N. Y.

409,618.—Photographic Developing Bath.
Chas. Spiro, New York, N. Y.

409,874.—Photographic Camera.
George Shorkley, New York, N. Y.

409,981.—Photographic Lens.
Charles H. E. Krogmann, Cincinnati, Ohio.

410,135.—Magic Lantern for Adverrising and other purposes.
C. C. Bruckner and H. W. Thornton, New York, N. Y.

410,898.—Machine for Casting Photographic Plates.
Marcus Kattentidt, Hameln, Prussia, Germany.

411,092.—Magic Lantern.
J. B. Coit, New York, N. Y.

411,253.—Apparatus for Holding and Washing Photographic Negatives.
Wm. K. Moody, Boston, Mass.

412,094.—Photographic Printing Frame.
Geo. A. James, San Francisco, Cal.

Designs.

18,853.—Photographic Exhibitor.
G. M. Porteous and F. S. Miller.
18,870.—Photographic Exhibitor Stand.
G. M. Porteous and F. S. Miller.
18,871.—Photographic Exhibitor Case Body.
G. M. Porteous and F. S. Miller.
18,872.—Photographic Exhibitor Stand.
G. M. Porteous and F. S. Miller.
18,876 to 18,878.—Photographic Exhibitor Case body.
G. M. Porteous and F. S. Miller.

Trade Marks.

16,158.—Photographic Album.
Koch Sons & Co.
16,320.—Photographic Paper.
A. Schaeffner.
16,701.—Appliances for Taking Photographs.
C. Spies.

RATES OF DOMESTIC POSTAGE

TO ANY PART OF THE UNITED STATES, CANADA, OR MEXICO.

SEE NOTE H.

	cts.	oz.	See Spec'l Note.
Address Tags	1	1	*a*
Bill Heads	1	1	*a*
Blotters (printed)	1	1	*a*
Blue Prints	1	2	*d*
Books, printed	1	2	*d*
Cards, playing	1	1	*a*
" printed " business " Christmas, etc. " Easter " New Year	1	2	*a*
Chromos	1	2	*a*
Catalogues	1	2	*d*
Circulars	1	2	*d*
Coins	1	1	*a b*
Copy (MSS.)	2	1	*e*
" (with proof sheets)	1	2	*e*
Crayon	1	1	
Desk Blotters	1	1	*a*
Drawings / Designs } Pen or Pencil	1	1	* *e*
Easter Cards	1	2	*a*
Engravings	1	2	*a*
Handbills	1	2	*a*
Letters	2	1	*e*
Labels (printed)	1	2	*a*
Lithographs	1	2	*a*
Manifold Letters	2	1	*e*
Manuscript	2	1	*e*
Magazines	1	4	*d*
Merchandise	1	1	*a b*
Maps (printed)	1	2	*e*
Newspapers	1	4	*d*
New Year Cards	1	2	
Packages, sealed	2	1	*b*

	cts.	oz.	See Spec'l Note.
Packages, unsealed	1	1	† *b*
Pamphlets	1	2	*d*
Patterns (cut)	1	1	*a*
Periodicals	1	4	*d*
PHOTOGRAPHS	1	2	*d*
Pictures (scrap)	1	2	
Playing Cards	1	1	*a*
Postal Cards	1	ea.	*f*
Printed Matter (*not merchandise or samples*)	1	2	*d*
Printed Envelopes	1	1	*a*
Prospectuses	1	2	*d*
Proof Sheets	1	2	*d g*
Plans (in writing)	2	1	*e*
Registration	10	ea.	*i*
Samples	1	1	*b*
Sample copies of regular publications mailed by publisher (second-class)	1	lb.	
Sample copies of regular publications not mailed by publisher	1	4	*a*
Scrap Pictures	1	2	*a*
Seeds, Plants, etc.	1	2	
Specie	1	1	*a b*
Stereoscopic Views	1	2	*d*
Tickets	1	2	*a*
Type Writer Work	2	1	*e*
Valentines (if printed without embellishment with silk, satin, etc.	1	2	*a*
Visiting Cards (printed)	1	2	*a*

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* If pen or pencil drawings contain no written letters, figures, or words, they are 4th class matter, otherwise 1st class.

† May be either 3d or 4th class.

GENERAL NOTES.

Cards, circulars, catalogues, etc., relating to the business of one or more firms, and different articles of all kinds and classes, may be placed in the same package, provided that the highest rate of postage that any of the contents is subject to shall be paid on the whole package.

The following articles are unmailable and will not be forwarded in any case: — Spirituous, malt or vinous liquids, poisons, explosive matter, inflammable articles, live or dead animals, insects (except queen bees when safely secured), substances exhaling a bad odor, fresh fruits and vegetables, obscene or indecent books, prints, writings, or papers; all postal cards or letters on the envelopes of which lewd, obscene, or lascivious delineations, offensive duns, epithets, terms, or language are written or printed, all matter concerning lotteries or schemes devised and intended to defraud the public, or for the purpose of obtaining money under false pretences, and all mail matter not addressed to a post office or to no particular person, firm, company, or publication.

Special Delivery.—Any mail matter, when bearing, in addition to the regular postage, a "special delivery" stamp (face value ten cents), will be delivered within one mile of any post office in the United States, or within carrier limits in any town having letter carrier delivery. between 7 a. m. and 11 p. m. (9 p. m. at other offices), by messengers from the delivering station.

Note A.

Fourth Class Matter.—Samples and Merchandise.—Weight limited to four pounds. Postage must be fully prepaid. Merchandise may have printing on it or on the wrapper. Written marks in addition to the address are allowed on Fourth Class matter, as follows:—The name and address of sender preceded by the word "From"; also the names and number or quantity of theaticles enclosed; and any names, numbers, marks, or letters for the purpose of description. A request to the delivering Postmaster may also be written asking him to notify sender if the package is not delivered.

Note B.

Articles of the Fourth Class liable to injure or deface the mails, such as flour, sugar, glass, needles, nails, pens, etc., must first be placed in a bag, box, or open envelope, which must then be enclosed in another outside tube or box, made of metal or hard wood without sharp corners or edges, and having a sliding clasp or screw lid, thus securing the articles in a double package; if the articles are fragile they must be packed with sawdust, cotton or other packing material in the inside packet. Powdered articles, such as flour, sugar, etc., must be enclosed in a transparent bag. Admissible liquids and oils (not exceeding 4 ounces liquid measure), pastes, salves or articles easily liquefiable, must conform to the following conditions: When in glass bottles or vials, such bottles or vials must be strong enough to stand the shock of handling in the mails, and must be enclosed in a wooden or papier-mache block or tube not less than three-sixteenths of an inch thick in the thinest part, strong enough to support the weight of mails piled in bags and resist rough handling; and there must be provided between the bottle and its wooden base, a cushion of cork crumbs, cotton, felt, asbestos, or some other absorbent, sufficient to protect the glass from shock in handling; the block or tube impervious to liquids, including oils, etc., to be closed by a tightly fitting screw-lid of wood or metal,with a rubber or other pad so adjusted as to make the block or tube water-tight and to prevent the leakage of the contents in case of breaking of the glass. When enclosed in a tin cylinder, metal case or tube, such cylinder, case or tube should have a screw-lid with a rubber or cork cushion inside in order to make the same water-tight, and should be securely fastened in a wooden or papier-mache block (open only at one end) and not less in thickness and strength than above prescribed. Manufacturers or dealers, intending to transmit articles or samples in considerable quantities, should submit a sample package, showing their mode of packing, to the Postmaster at the mailing office who will see that the conditions of this section are carefully observed.

Note D.

Third Class Matter.—PREPAYMENT.—Postage must be fully prepaid, otherwise will be "held for postage." THE LIMIT OF WEIGHT IS four pounds, except on single books. WRITING.—No writing is permitted on Third Class matter except as follows: The name and address of the sender on the outside or inside of package, preceded by the word "From," and any printing not in the nature of personal correspondence. The sender is further allowed to mark a word or passage in a book or paper to which he desires to call special attention. He may also write a simple inscription or dedication upon the cover or blank leaf of a book or pamphlet. Dates, addresses, and signatures of circulars may be written. Any other writing on Third Class matter will subject the package to letter rates of postage, and render the sender liable to a fine of Ten Dollars. PHOTOGRAPHS and BLUE PRINTS must bear no other writing than the name of the sender.

WRAPPING.—Mail matter of the Third Class must be so wrapped or enclosed that it can be readily examined without destroying the wrapper; otherwise it will be subject to postage at the First Class rate (two cents per ounce), as will all articles enclosed in sealed envelopes with clipped ends, sides or corners, or in boxes with covers secured by nails, and all packages the wrappers of which are secured to the enclosure by postage stamps.

Note E.

First Class.—This class includes letters, postal cards, sealed packages, all matter wholly or partly in writing (whether manuscript or produced by type-writer or copying press), drawings, designs, plans, maps, produced by hand, manuscript for publication not accompanied by proof sheets, and all personal correspondence, whether in writing or in print. (See under heads "Third Class," "Fourth Class," notes "A" and "D," certain writing permitted in or on articles of those Classes.)

The rate of postage on mail matter of the First Class (sealed or unsealed) is TWO CENTS FOR EACH OUNCE OR FRACTION THEREOF, excepting postal cards, and excepting also letters for *local delivery* posted at the post office where no letter carriers are employed, in which case the rate is ONE CENT PER OUNCE OR FRACTION THEREOF.

The law provides that the postage on all mail matter of the First Class shall be prepaid only by postage stamps or by enclosure in government stamped envelopes, and that any article of this Class (not entitled by law to free transmission in the mails) deposited in a post office wholly unpaid or prepaid *less than one full rate, can not be forwarded or delivered,* but must be "held for postage." LIMIT OF WEIGHT.—There is no limit to the weight of letters or packages of First Class matter. WRAPPING OR ENCLOSURE.—Mail matter of the First Class may be wrapped or enclosed in any manner that the sender may desire. RETURN.—Letters not delivered will be returned to writer free, if a request to that effect is placed on the envelope. FORWARDING.—A letter will be forwarded by the Postmaster who may hold it, to another post office at the request of the person to whom the letter is addressed. Letters addressed to the care of another person, or erroneously delivered, may be redirected and returned to post office and will be forwarded without additional charge.

Note F.

Postal Cards.—No cards are "Postal Cards" except those issued by authority of the Postmaster-General (the imitation of which is forbidden and punished by law), and so-called "Postal Cards" issued by private parties are subject to letter rates of postage when they contain any written matter whatever in addition to the date, and the name of the addressed and of the sender, and the correction of mere typographical errors therein. Nothing whatever may be attached to a Postal Card except an address tag or label, which may be affixed to the *address side*, and no printing or writing is permitted upon the address side of postal cards, except that imprinted thereon at the manufactory and such as may be necessary for the proper direction of the same. Postal Cards are returned to the senders when unclaimed, but requests to so return should *not* be placed on the address side. Postal Cards are unmailable as such when incomplete or mutilated, and in all cases where any of the above conditions are not complied with.

Note G.

Proof Sheets may be corrected or uncorrected, with or without the original manuscript, additions to or alterations in the matter, or directions as to the typographical part of the work (but not as to binding, quality of paper, etc.).

Note H.

Samples, printed matter and merchandise sent to Canada and Mexico are subject to the same conditions as to rates of postage (which must be fully prepaid) inclosure, weight, etc., as in the United States. Dutiable books from Canada are treated in the same manner as those from other foreign countries. Requests for return of undelivered letters from the United States are only complied with when *printed* on their envelopes.

Note I.

Registration.—All kinds of mail matter (except Second Class matter) can be registered at the rate of 10 cents for each package, to be fully prepaid by stamps, in addition to the postage at regular rates; all conditions as to marks, contents and method of securing packages being the same as described under the various classes (notes *a*, *d*, *e*). Each package must bear name and address of sender, and a receipt will be returned from the person to whom addressed.

Domestic Money Orders.

For sums not exceeding $	5	$0 05
" " "	10	08
" " "	15	10
" " "	30	15
" " "	40	20
" " "	50	25
" " "	60	30
" " "	70	35
" " "	80	40
" " "	100	45

The fee for a Postal Note is 3 cents.

A Postal Note may be drawn for any amount from one cent to four dollars and ninety-nine cents.

INTERNATIONAL MONEY ORDERS.

The fees for International Money Orders are as follows:

For sums not exceeding $10	$0 10
Over $10 and not exceeding $20	20
" 20 " " 30	30
" 30 " " 40	40
" 40 " " 50	50
" 50 " " 60	60
" 60 " " 70	70
" 70 " " 80	80
" 80 " " 90	90
" 90 " " 100	1 00

The sender of a money order must state the particulars thereof upon a form furnished by the post-office.

A money order may be endorsed once only.

The person who presents a money order for payment must be identified if unknown to the postmaster.

A domestic money order may be repaid within a year at the office of issue. The fee will not be refunded.

Duplicates of lost or invalid money orders are issued by the department free of charge upon application made through the issuing or paying postmaster by remitter, payee or indorsee.

The issue of money orders on credit is prohibited.

A money order may be paid to a second person by endorsement of payee, or upon a written order or power of attorney to be filed with the paying postmaster.

A duplicate cannot be obtained of a postal note lost or destroyed.

An invalid postal note, that is, one not paid within three months from the last day of month of issue, will be replaced at an extra charge of three cents, by a duplicate issued by the department, to be applied for through the postmaster at any money order office.

International money orders may be drawn for payment in the following countries:

Alexandria (Egypt), if drawn as a French order, Algeria, Beyroot, (Turkey), Canada, Cape Colony, Constantinople, (Turkey), France, Gibraltar, Great Britain and Ireland, Hawaiian Islands, Jamaica, Leeward Islands, Malta, Newfoundland, New South Wales, New Zealand, Queensland, Salonica, (Turkey). Smyrna, (Turkey), Tasmania, Windward Islands, Victoria, (Australia),	Order should be sent by remitter to payee.
Alexandria (Egypt), if drawn as a British order, Amoy, (China), Austria—Hungary, Azores, Belgium, Bermuda, Canton, (China), Ceylon, Danish West Indies, Denmark.	Order may be kept by remitter as a receipt.
Egypt, Falkland Islands, Foochow, (China), Gambia, (Africa), Germany, Hankow, (China), Hoihow, (China), Hong Kong, (China), Iceland, India, (British), Italy, Japan, Luxemburg, (Grand Duchy), Maderia Islands, Malacca, (Straits Settlements), Mauritius, Natal, Netherlands, Ningpo, (China), Norway, Penang, (Straits Settlements), Portugal. Saint Helena, Shanghai, (China), Singapore, (Straits Settlements), South Australia, Swatow, (China), Sweden, Switzerland, Tangier, (Morocco). Trinidad, Western Australia,	Order may be kept by remitter as a receipt.

RATES OF POSTAGE TO FOREIGN COUNTRIES.

UNIVERSAL POSTAL UNION.

Treaty concluded at Berne, Switzerland, October 9th, 1874.

	Cts.
Letters, per 15 grams or ½ ounce (prepayment optional, except to places marked *).	5
Postal Cards, each	2
Newspapers and other printed matter, per 2 ounces	1
Commercial papers, First 10 ounces or fraction thereof	5
Commercial papers, Every additional 2 ounces	1
Samples of merchandise, First 4 ounces	2
Samples of merchandise, Every additional 2 ounces	1
Registration Fee on letters or other articles	10

All correspondence other than letters must be prepaid at least partially.

†Correspondence paid to British Indian Frontier only.

International Money Orders are issued only to Countries or Places marked ¶.

☞ For Places not mentioned below, not in the Universal Postal Union, see Table page 327.

COUNTRIES OR PLACES WHICH, WITH THE UNITED STATES, CANADA AND MEXICO, ARE COMPRISED IN THE UNIVERSAL POSTAL UNION.

(*The Italics in brackets represent the Nationality of Foreign Possessions.*)

Abyssinia, East Africa.
Aden, Arabia, British P. O.
Africa (W. C.) Br. Colonies.
Africa (Fr. Port. & Sp. pos.)
Ajuda, Africa. (*Portuguese*)
Algeria, Africa. (*French.*)
Algeirs, Africa. (*French.*)¶
Alhucemas, N. Africa. (*Sp.*)
Amar, Asia. (*Spanish.*)
Amirante Islands, E. Africa.
Amoy, Hong Kong P. O.
Andorra, Rep. of (*Spain.*)
Angola, Africa. (*Portug'se.*)
Annobon Isl'd., Africa. (*Sp.*)
Antigua, Isl'd. W.I. (*British*)
Aracan, British India.
Argentine Republic.
Aruba, S. America. (*Dutch.*)
Asia (Dch., Fr., Pr. & Sp. Col.)
Aspinwall, U.S. of Colombia.
Assinie, Africa. (*French.*)
Austria-Hungary.¶
Azores Islands. (*Port.*)¶
Bahama Islands. (*British.*)
Bakel, Africa. (*French.*)
Balearic Isles. (*Spanish*)
Bali, Asia. (*Dutch.*)
Banca, Asia. (*Dutch.*)
Barbadoes, W. I. (*British.*)¶
Barbary (Tunis & Tripoli.)
Batavia, Java, Asia. (*Dutch*)
Bay Islands, Sp. Honduras.
Belgium.¶
Bermuda Islds., W. I. (*Br.*)
Bien-Hoa, Coch.-China. (*Fr*)
Billiton, Asia. (*Dutch.*)
Bissao, Africa. (*Portug'se.*)
Bogota, U.S. of Colombia.
Bolivia, South America.
Bonaire Islds., W.I. (*Dutch.*)
Borneo, Asia. (*Dutch.*)
Bourbon, Isld., Africa. (*Fr.*)
Brazil, South America.
Bulgaria, Principality of
Burmah, British India.
Cabul, Afghan, *via* Italy.*†
Cacheo, Isld., Africa. (*Port*)
Cambodia, Fr. P. Offices in.
Cameroons (or Kameroun), West Africa.
Canary Islands. (*Spanish.*)
Canton, Hong Kong, P. O.
Cape Verde Is., Afr. (*Port.*)
Caroline Is., Oceanica. (*Sp.*)
Carthagena, U. S. Colombia.
Casablanca, Morocco. (*Sp.*)
Celebes, Asia. (*Dutch.*)
Ceuta, N. Africa. (*Spanish.*)
Ceylon. (*British.*)
Chaffarine Is., N. Afr. (*Sp.*)
Chandernagore, India. (*Fr.*)
Chili, South America,
China, *via* Russia.
China, *via* Hong Kong.
China, *via* France.
Cochin China (French Col. in)
Colombia (U.S. of) S. Amer.
Comino, Malta. (*British.*)
Cominotto, Malta. (*British.*)
Congo (State of) W. Africa.
Constantinople, Turkey.¶
Corisco Is., Africa. (*Sp.*)
Costa Rica, Cent'l America.
Cuba, W. I. (*Spanish.*)
Curacoa Is., W.I. (*Dutch.*)
Cyprus Island, (*British.*)
Dagana, Senegal. (*French.*)
Damao, Asia. (*Portuguese.*)
Denmark.¶
Desirade Isld., W. I. (*Fr.*)
Diu, Asia. (*Portuguese.*)
Dominica Isld., W. I. (*Brit.*)
Dominica, Rep. of, W. I.
Ecuador, S. America.
Egypt, Africa.¶
Falkland Is., S. Amer. (*Br.*)
Faroe Islands, Denmark.
Fernando Po. Is., Afr., (*Sp.*)
Finland, Gr. Duchy, Russia.
Flores, Asia. (*Dutch.*)
Foo-chow, Hong Kong P. O.
Formosa, *via* Hong Kong.
France.¶
French Colonies, all.
Fusam-po, Corea, Jap. P.O.
Gaboon, Senegal. (*French.*)
Gambia, W. Africa. (*Br.*)
Gambier, Is., Oceanica. (*Fr*)
Genzanshin, (Corea.) Japanese P. O. at.
Germany.¶
Gibraltar, Spain. (*British.*)
Goa, Asia. (*Portuguese.*)
Gold Coast, W. Africa. (*Br.*)
Goree, Senegal. (*French.*)
Gozzo, Malta. (*British,*)
Grand Bassam, W. Afr. (*Fr*)
Great Britain.¶
Greece.
Greenland, N. America.
Grenada, Isld., W. I. (*Br.*)¶
Grenadines Is., W. I. (*Br.*)
Guadeloupe Is., W. I. (*Fr.*)
Guadur, British India.
Guatemala, Centr. America.
Guiana, Br., Fr. and Dutch.
Hankow, Hong Kong P. O.
Hawaii, Sandwich Islands.¶

RATES OF POSTAGE TO FOREIGN COUNTRIES—*Continued.*

Hayti, Isld., W. I.
Hatien, Cochin China. (*Fr.*)
Heligoland Isld., Germany.
Hindostan, British India.
Hoihow, Hong Kong P. O.
Holkar, Br. Ind. *via* Italy.†
Honduras, Br. C. America.
Honduras, Rep. C. America.
Hong Kong, China.¶
Hungary.
Hyderabad, Ind.,*via* Italy.*†
Iceland Isld., Denmark.
India, British.¶
India (French Est'blish'ts in)
Ionian Isles, Greece.
Ireland.¶
Isle of Pines, Oceanica. (*Fr.*)
Italy.¶
Jamaica, Isld., W. I. (*Br.*)¶
Japan, Asia.¶
Java, Batavia, Asia (*Dutch*).
Jinsen (Corea), Jap. P. O. at
Kalgan, China, *via* Russia.
Kameroun.
Karakal, India. (*Fr.*)
Kashmir, Ind., *via* Italy.*†
Kiung-Chow, H'g K'g P. O.
Labrador.
Labuan, Philippine Isl. (*Br.*)
Ladakh, Thibet *via* Italy.*
Ladrone Is., Oceanica (*Sp.*)
Lagos, W. Africa (*Br.*)
Larrache, Morocco. (*Span.*)
Les Saintes, Is., W. I. (*Fr.*)
Leeward Is., W. I. (*Br.*)
Liberia, Africa.
Lichtenstein, Princ. Austria.
Lombok, Asia. (*Dutch.*)
Low Islds., Oceanica. (*Fr.*)
Loyalty Is., Oceanica (*Fr.*)
Luxemburg (Gr. Duchy of).¶
Luzon, Philippine Is, (*Sp.*)
Macao Hong Kong P. O.
Macassar, Asia. (*Dutch.*)
Madagascar Isls., Afr. (Ste. Marie and Tamatave *only*).
Madeira, Isld., Portugal.¶
Madura, Asia. (*Dutch.*)
Mahe, India. (*French.*)
Malacca Straits Sett's. (*Br.*)
Malta, Isld. (*British.*)
Mandalay, Br. Indian P. O.
Manila, Philippine Isls. (*Sp.*)
Mariana Is., Oceanica. (*Sp.*)
Marie Galante, Is.,W. I. (*Fr.*)
Marquesas Is., Oce'ca. (*Fr.*)
Martinique Is., W. I. (*Fr.*)
Massowah, R. Sea (It.P.O. at)
Mauritius Is., Africa. (*Br.*)
Mayotte, W. Africa. (*Fr.*)
Mazagan, Morocco. (*Span.*)
Mililla, N. Africa. (*Span.*)
Mindanao, Philip'ne Is. (*Sp.*)
Miquelon, Is., N. Am. (*Fr.*)
Mogador, Morocco (*Sp.*)
Moldavia, Roumania.
Moluccas, Asia. (*Dutch.*)
Monaco, Princip. of France.
Montenegro.
Montserrat, W. I. (*British.*)
Morocco, Fr. & Sp. P. O. in
Mozambique, Africa. (*Port.*)
Muscat, British Indian P. O.
Mysore, Br. Ind., *via* Italy.†
Mytho, Cochin China. (*Fr.*)
Nassau, N. P. Bahamas. (*Br.*)
Navigators Islands (Ger. P. O. at Apia.)
Netherlands.¶
Netherland Colonies in Asia, America and Oceanica.
Nevis, Isld., W. I. (*British.*)
New Caledonia, Ocean. (*Fr.*)
Newfoundland.
New Guinea,Oce'ca. (*Dutch.*)
Nicaragua, Centr. America.
Ning-po, Hong Kong, P. O.
Norway.¶
Nossi-be, W. Africa. (*Fr.*)
Nubia, Egypt.
Obock, East Coast of Africa (French P. O. at.)
Ourga, China. *via* Russia.
Palawan, Philip'ne Is. (*Sp.*)
Panama, U. S. of Colombia.
Panay, Philip'ne Isl. (*Sp.*)
Papua, Oceanica. (*Dutch.*)
Paraguay, S. America.
Patagonia, S. America.
Pegu, British India.
Pekin, China, *via* Russia.
Penang, Straits Settlts. (*Br.*)
Penon de Gomera, N.Af. (*Sp.*)
Persia, Asia.
Persian Gulf, Br. Ind. P. O.
Peru.
Philippine Is., Ocea. (*Sp.*)
Pines, Isle of, Oceanica.
Pondicherry, India. (*Fr.*)
Porto Rico, W. I. (*Span.*)
Portugal.¶
Port. Col'o's, Asia & Africa.
Poulo-Condor, C. China. (*Fr.*)
Prince, Isld., Africa. (*Port.*)
Rabat, Morocco, Spa. P. O.
Reunion Isld., Africa. (*Fr.*)
Rhio-Riouw, Asia. (*Dutch.*)
Rodrigues Is., Africa. (*Br.*)
Roumania.
Russia.
Saba Islds., W.I. (*Dutch.*)
Saffi, Morocco, Span. P. O.
Saigon, Cochin China. (*Fr.*)
Salvador, Central America.
Samoan Islands (Ger. P. O. at Apia.)
Sandwich Islds., Oceanica.
San Domingo Republic, W. I.
San Marino Republic, Italy.
Senegal, W. Africa. (*Fr.*)
Senegambia, W. Africa. (*Br.*)
Servia.
Seychelles, Is., Africa. (*Br.*)
Shanghai (U. S. Postal Agency at.)
Shanghai *via* Hong Kong.
Shanghai *via* France.
Siam, Asia.
Sierra Leone, W. Af. (*Br.*)
Singapore, Asia. (*British.*)
Soudan, Egypt.
Spain.
Spanish Colonies in Asia, Africa, America & Oce'ca.
St. Bartholomew, Is'ld, W.I. (*Swed.*)
St. Christopher I., W.I. (*Br.*)
St. Croix Isl., W. I. (*Dan.*)
St. Domingo, Republic, W. I.
St. Eustatius Is., W.I. (*Dut.*)
St. John Is., W. I. (*Dan.*)
St. Kitt's Is., W. I. (*Br.*)
St. Lucia Is., W. I. (*Br.*)¶
St. Louis, W. Africa. (*Fr.*)
Ste. Marie Madagasc'r. (*Fr.*)
St. Martin, W. I. (*Fr. & Dut.*)
St. Pierre, W. I. (*French.*)
St. Thomas Is. W. I. (*Dan.*)
St. Thome Is.. Afr. (*Port.*)
St. Vincent, W. I. (*Br.*)¶
Staten Island, S. America.
Straits Settlem'ts, Asia. (*Br.*)
Sumatra, Asia. (*Dutch.*)
Sumbawa, Asia. (*Dutch.*)
Surinam, S. America. (*Dut.*)
Swatow. Hong Kong P. O.
Sweden.¶
Switzerland.¶
Tahiti Isld., Oceanica. (*Fr.*)
Tamatave, Madagasc'r. (*Fr.*)
Tangier, F. & Span. P. O.
Tenasserim, British India.
Terra del Fuego.
Tetuan, Morocco, Sp. P. O.
Tien-Tsin, China, *via* Russia.
Timor, Asia. (*Dut. & Port.*)
Tobago Isld., W. I. (*Br.*)¶
Tonquin (French P. O. in.)
Toubouai, Oceanica. (*Fr.*)
Trinidad Isld., W. I. (*Br.*)
Tripoli (Italian P. O. at.)
Tschandok, Co. China. (*Fr.*)
Tuamotou, Oceanica. (*Fr.*)
Tunis, (Fr. and Italian P. O.)
Turkey—Europe and Asia.
Turk's Island, W. I. (*Br.*)
Uruguay, S. America.
Venezuela, S. America.
Vingh-Long, C. China. (*Fr.*)
Virgin Isles, W. I. (*British.*)
Wallachia, Roumania.
West Indies.
Yanaon, India. (*French.*)
Zanzibar, Afr., *via* Aden.*

COUNTRIES OR PLACES NOT IN UNIVERSAL POSTAL UNION.

Prepayment is compulsory.
† The limit of payment is at port of debarkation ; for all other places, to destination.
‡ Samples are not accepted for these destinations.
§ Registration is allowed on letters and other articles. Fee, 10 cents.
‖ Registration is allowed *only* on letters. Fee, 10 cents.
¶ Money orders are issued at same rates as specified at top of page 327.
Postal cards can not be sent from the United States to any of the following places *except* Canada.

COUNTRIES OR PLACES OF DESTINATION.	PER 15 GRAMS, OR ½ OUNCE.	NEWS-PAPERS.		OTHER PRINT'D MATTER AND SAMPLES	
		LIMIT OF WEIGHT.	EACH PAPER.	LIMIT OF WEIGHT.	EACH PACKAGE.
	Cts.	Oz.	Cts.	Oz.	Cts.
Africa (West Coast), except Liberia, and British, French, Spanish and Portuguese Colonies, by British Mail †	15	4	4	2	5
Ascension Island, S. Atlantic, British Mail	15	4	4	2	5
Australia, except N. S. Wales, Queensland, and Victoria, *via* San Francisco †‡‖	5	no	2	2	2
Australia, all parts, by British Mail, *via* Brindisi ‖	12	no	2	4	4
Basutoland, *see* Cape Colony.					
Bechuanaland, S. Africa, British Mail §	21	4	5	2	7
British Columbia, *see* Canada.					
Caffraria, *see* Cape Colony.					
Canada (*Limit of Letter Weight : 30 grams, or 1 oz. Postcards and all printed matter at domestic rates*) §¶	2	4	1	8	10
Cape Colony, S. Africa, British Mail §¶	15	4	4	2	5
Chatham Islands, Oceanica, *via* San Francisco ‖	12	no	2	4	4
China, British Mail, *via* Brindisi §	13	4	5	2	4
Comoro Islands.					
Fiji Islands, *via* San Francisco and Sidney †‡	5	no	2	2	2
Griqualand, *see* Cape Colony.					
Kimberly.					
Madagascar, except St. Mary's and Tamatave, by British Mail. †	23	4	6	2	7
Morocco, except Spanish Possessions on West Coast †	15	2	2	2	2
Natal, S. Africa, by British Mail §	15	4	4	2	5
Navasa, West Indies, direct mail †‡	5	no	2	2	2
Navigator's Islands, Pacific †‡	5	no	2	2	2
New Brunswick, *see* Canada.					
New South Wales.¶					
New Zealand, *via* San Francisco ‖¶	12	no	2	4	4
New Zealnad, British Mail, *via* Brindisi ‖¶	12	no	2	4	4
Norfolk Island, Pacific, *via* San Francisco ‖	12	no	2	4	4
Nova Scotia, *see* Canada.					
Orange Free State, *see* Cape Colony.					
Pitcairn Island, Pacific (*No registration.*) †‡	5	no	2	2	2
Prince Edward Island, *see* Canada.					
Queensland ¶					
St. Helena, South Atlantic, British Mail §	15	4	4	2	5
Samoan Islands, *see* Navigator's Islads.					
Shanghai, direct, *via* San Francisco ‡‖	5	no	2	2	2
Tasmania ¶					
Transvaal, South Africa, British Mail §	21	4	5	2	7
Vancouver's Islands, *see* Canada.					
Van Dieman's Land.					
Victoria ¶					
West Indies, all places not in Postal Union, direct mail †‡	5	no	2	2	2

SUGGESTIONS TO THE PUBLIC.

Mail all letters, etc., as early as practicable, especially when sent in large nnmbers, as is frequently the case with newspapers and circulars. The trouble of the post-office is much diminished if letters, when mailed in large numbers, are tied in bundles, with the addresses all in one direction.

Make the address legible and complete, giving the name of the post-office, county, and State. The name of the street and number of the house should also be given on letters addressed to cities where letter-carriers are employed; while the letter will eventually reach its destination without a number, the omission is often a cause of hesitation and delay. In the case of letters for places in foreign countries, and especially in Canada, in in which country there are many post-offices having the same names as post-offices in the United States and in England, the name of the country as well as the post-office should be given in full. Letters addressed, for instance, merely to "London," without adding "England," are frequently sent London, Canada, and *vice versa*, thereby causing delay, and often serious loss. Letters addressed to Burlington, N. S. (Nova Scotia), often go to Burlington, New York, on account of the resemblance between S and Y when carelessly written. It would be better to write out the names of States in full.

Avoid, as much as possible, using envelopes made of thin paper, especially where more than one sheet of paper, or any other article than paper, is enclosed. Being often handled, and even in the mail-bags subject to pressure, such envelopes not unfrequently split open, giving cause of complaint against officials who are entirely innocent in the matter.

Never send money or any other article of value through the mail, except either by means of a money-order or in a registered letter. Any person who sends money or jewelry in an unregistered letter not only runs a risk of losing his property, but exposes to temptation every one through whose hands his letter passes, and may be the means of ultimately bringing some clerk or letter-carrier to ruin.

See that every letter contains the full name and post-office address of the writer, with county and State, in order to secure the return of the letter, if the person to whom it is directed cannot be found. A much larger portion of the undelivered letters could be returned if the names and addresses of the senders were always fully and plainly written or printed inside or on the envelopes. Persons who have large correspondence find it most convenient to use "special request envelopes;" but those who only mail an occasional letter can avoid much trouble by writing a request to "return if not delivered," etc., on the envelope.

When dropping a letter, newspaper, etc., into a street mailing-box, or into the receptacle at a post-office, always see that the packet falls into the box, and does not stick in its passage; observe, also, particularly, whether the postage-stamps remain securely in their places.

Postage-stamps should be placed on the upper right-hand corner of the address side of all mail-matter.

Postmasters are not obliged to accept in payment for postage stamps or stamped envelopes, wrappers, etc., any currency which may be so mutilated as to be uncurrent, or the genuineness of which cannot be clearly ascertained. They are not obliged to receive more than twenty-five cents in copper or nickel coins. They are not obliged to affix stamps to letters, nor are they obliged to make change except as a matter of courtesy. They must not give credit for postage.

Letters cannot be carried out of the mail except in postage-stamped envelopes. There is no objection to a person who is not acting as a common carrier carrying a sealed letter, whether in a stamped envelope or not; but to continue the practice, or receive money for so doing, would subject the party to a penalty of one hundred and fifty dollars. Newspapers, magazines, and periodicals may be carried out of the mail for sale or distribution to subscribers, but if they are put into a post-office for delivery the postage must be paid thereon.

It is forbidden by the regulations of the Post-Office Department for postmasters to give to any person information concerning the mail matter of another, or to disclose the name of a box-holder at a Post-Office.

Mail-matter deposited in any receptacle erected by the Post-Office Department, such as street mailing-boxes for the reception of mail-matter to be collected by letter-carriers, or boxes in railroad depots for the reception of matter to be collected by employees of the railway mail service, cannot be reclaimed by any one under any circumstances. Persons depositing letters in the latter, intended for city delivery, do so at their own risk, and cannot reclaim them except through the Dead Letter Office.

Letters addressed to persons temporarily sojourning in a city where the Free Delivery System is in operation should be marked "Transient" or "General Delivery," if not addressed to a street and number or some other designated place of delivery.

All matter concerning lotteries, gift concerts, or schemes devised to defraud the public. or for the pupose of obtaining money under false pretences, is denied transmission in the United States mails.

The above rates, rules, and suggestions *apply to postal matters in the United States.*

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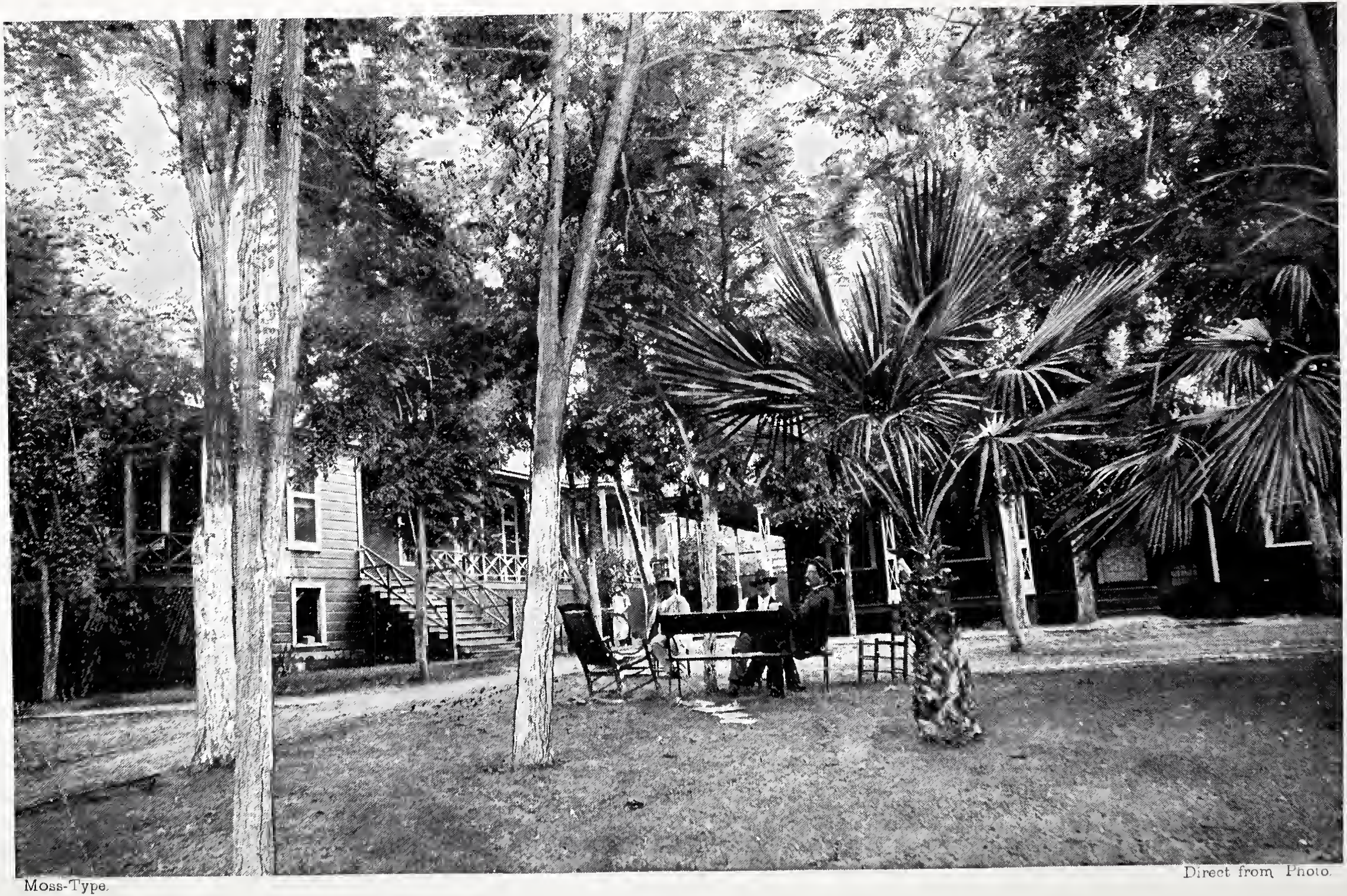

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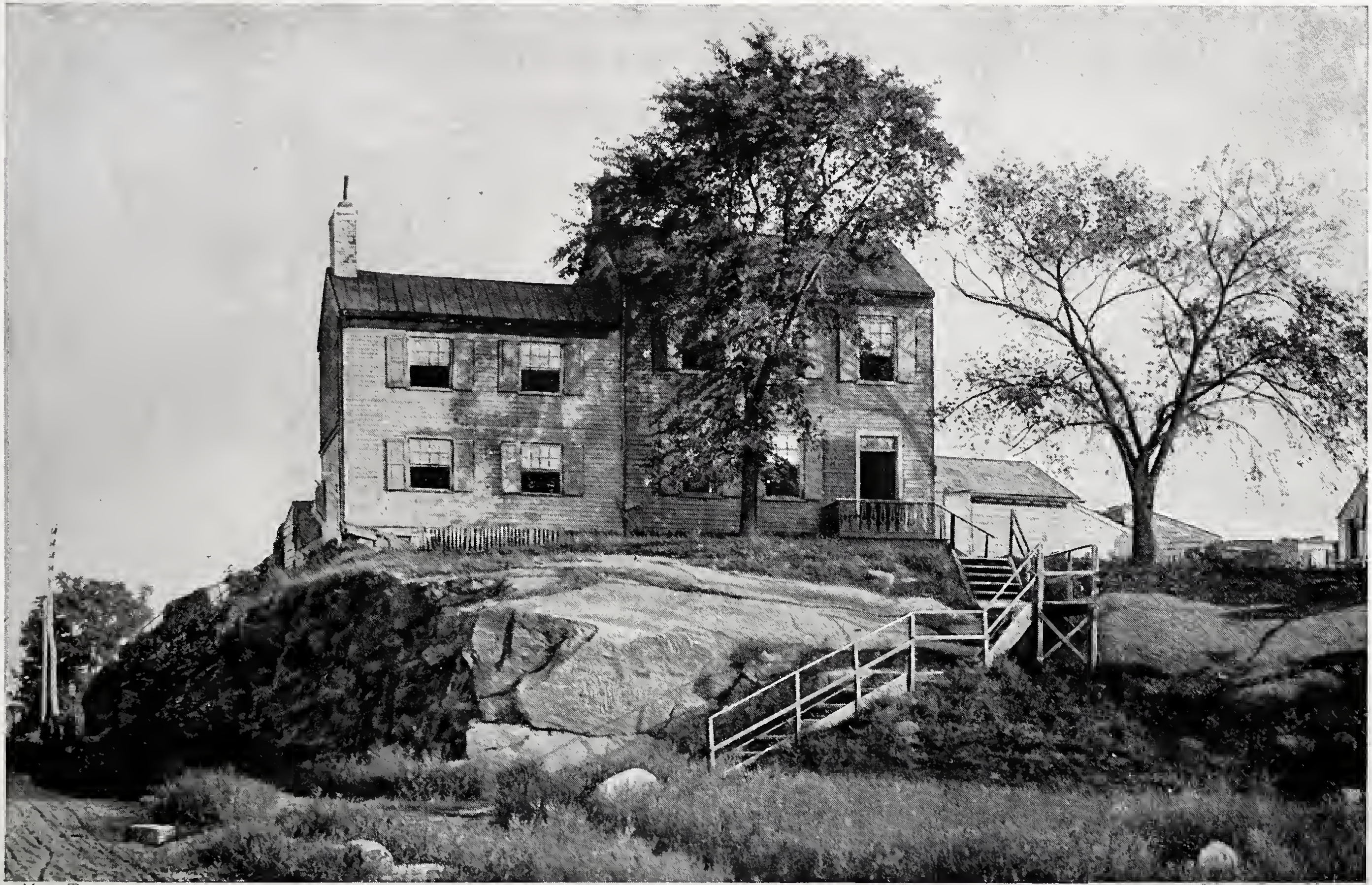

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SUN & SHADE

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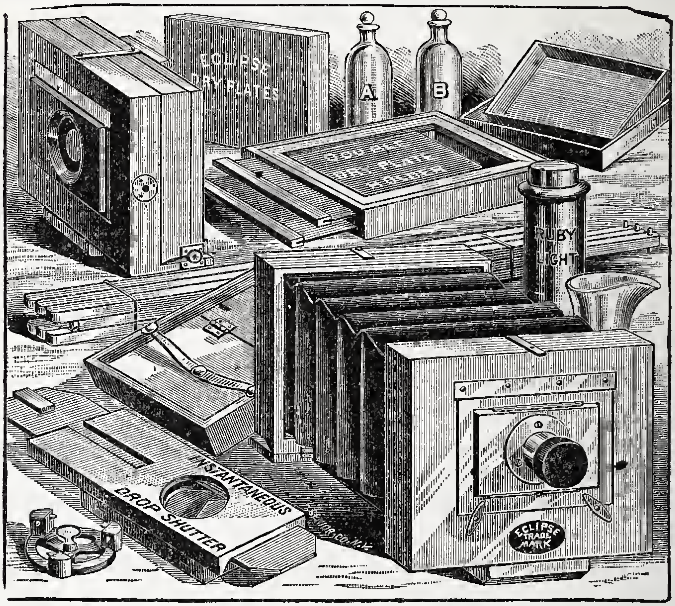

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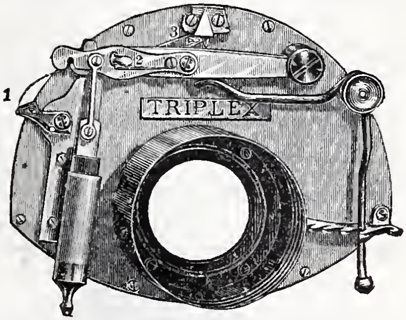

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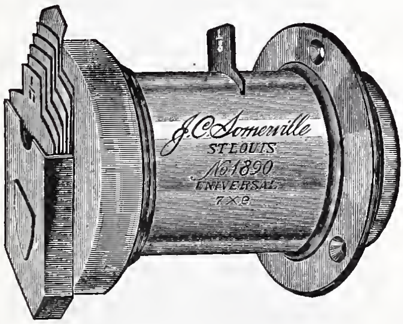

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3	2 1-8	12 3-4	8x10	40 00
4	2 7-16	14	10x12	50 00
5	2 11-16	18	12x15	60 00
6	3 3-16	21 1-2	16x20	75 00
7	4	30	18x22	140 00

FOR SALE BY ALL DEALERS.

A full set of six stops, numbered according to the method adopted by the Photo. Society of Great Britain, accompanies each Lens.

IF YOU ARE IN WANT OF A LENS

be sure to try ours before buying. Will be sent subject to five days' trial, and, if not satisfactory, return at my expense.

Our New Lens requires much less "stopping down" than other instruments—that is to say, a much larger stop can be used for the same size figure, diameter of Lens, etc., considered. This is an important advantage which has already been alluded to by many.

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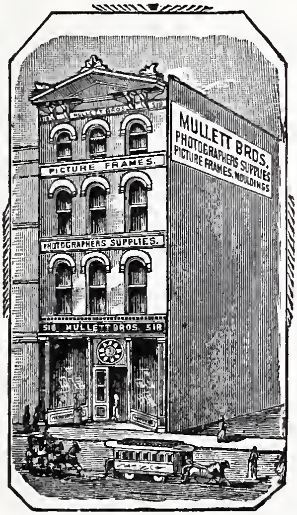
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"Keystone" Dry Plates

Have during 1889 fully sustained their previous High
Reputation and the demand was largely in
excess of that of any previous year.

"ECLIPSE," Sensitometer 27,

Are specially intended for Quick Studio Exposures, Concealed and Detective Cameras, Instantaneous Views, and Magnesium Flash-Light Photography, and

"Keystone Special," Sen. 23 to 25,

For Portraits, Instantaneous Views, Out-door Groups, etc. Blue Label.

"B" Plates, Sen. 16 to 20.

For Landscape Views and General Photography. Admittedly the finest plate for Amateurs.

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Give correct Color Values. The best plates for Landscapes, Interiors, Photo-Micrography, and Copying Paintings.

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For Photo-Mechanical Printers, made with "B" or Special Emulsion as desired.

Gelatino-Albumen "A" Plates,

Sensitometer 10 to 12, for Transparencies, on Thin Crystal Glass for Lantern-Slides, and selected plain and fine Ground Glass for large Transparencies.

Carbutt's Process Plate "B,"

Sensitometer 12, for Copying Line-Drawings for Photo-Engravers.

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THE SCOVILL & ADAMS COMPANY, NEW YORK,

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FLEXIBLE NEGATIVE AND POSITIVE FILMS

A • PERFECT • SUBSTITUTE • FOR • GLASS.

WEIGHT ALMOST DISPLACED.

CARBUTT'S FLEXIBLE NEGATIVE FILMS, are made on pure Sheet Celluloid of $\frac{10}{1000}$ of an inch in thickness, reducing weight and bulk to a minimum, and the enormous demand for them during 1889, attests their popularity, and their use extends over the entire Globe where photography is known.

No extra processes are necessary. Expose, develop, fix, wash, dry, and print from the same as Dry Plates. And being but $\frac{10}{1000}$ of an inch in thickness, can be printed from either side. These Films can be used in regular plate-holders for Studio or Landscape work.

PRICE OF FLEXIBLE NEGATIVE FILMS—PER DOZEN.

Coated with our "Special," "Eclipse," and "B" Landscape Emulsions.

3¼x4¼	$0 65	5 x 7½	$1 75
4 x5	95	5 x 8	1 80
4¼x5½	1 12	6½x 8½	2 50
4¼x6½	1 30	8 x10	3 60
4¾x6½	1 40	10 x12	5 40
5 x7	1 65	11 x14	7 00

In ordering Films to be sent by mail, add 5 per cent. to cost of Films to cover postage.

CARBUTT'S FLEXIBLE POSITIVE FILMS are made on sheets of White Celluloid, $\frac{10}{1000}$ of an inch in thickness, on which the most beautiful Positives can be made, resembling "Opals." The manipulation is the same as in making Transparencies.

PRICE LIST OF CARBUTT'S FLEXIBLE POSITIVE FILMS.

SIZE.	DOZEN.	SIZE.	DOZEN.
3¼x4¼	$0 55	6½x8½	$2 00
4 x5	80	8 x10	3 00
4¼x5½	90	10 x12	4 50
5 x7	1 40	11 x14	5 85
5 x8	1 50		

CARBUTT'S "ROXYLINE" ENAMEL.

For varnishing Positives, Transparencies and Negatives. Used Cold.
Price, 4 oz. bottle, 40 cents ; 8 oz. bottle, 75 cents.

MANUFACTURED BY

JOHN ✤ CARBUTT,

KEYSTONE DRY PLATE WORKS,

Wayne Junction, - Philadelphia, Pa.

FOR SALE BY ALL DEALERS.

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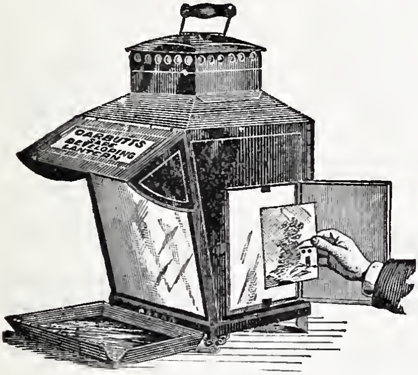
Multum in Parvo Dry Plate Lantern.



Lantern arranged for developing, and after fixing examining negatives by opal light.

Has three separate and distinct forms of light, each side and front. The left side door when open emits a clear white light for making Transparencies by contact. The front a safe 8 x 10 Ruby light for developing by. The right door when open a soft Opal light for examining Negatives or Transparencies.

It is fitted with coal oil lamp, silvered reflector, and movable hood on front to shade the eyes.

Price, $6.00.

Boxed ready for shipment.

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ENDORSED AS THE MOST EFFICIENT AND PRACTICAL DARK-ROOM LANTERN MADE.

PHOTOGRAPHIC SPECIALTIES.

CARBUTT'S HYDROCHINON DEVELOPER.

Will neither stain the fingers nor the plates, and, no matter how much the development is prolonged, the shadows will remain clear.

It gives negatives of quick-printing quality and fine wet-plate appearance. For Transparencies, Lantern-Slides, and Line-work Negatives it has no equal, as has been thoroughly demonstrated on Carbutt's Lantern and "B" Sen. 12 Plates.

Full and complete instructions for use accompany each bottle.

PRICE FOR TWO 8-oz. BOTTLES, 60 CENTS.

CARBUTT'S Keystone Dry Plate Varnish, 8 oz. bottle	**$ 50**
CARBUTT'S Translucent Ruby Paper, 25x20 ....25c.; by mail,	**30**
CARBUTT'S Concent'd Pyro and Soda-Potash Developer, two 8 oz. bottles in case,	**60**
Lantern-Slide Matts, round corner or circle, with gilt line around opening, per 100	**1 00**
Adhesive Binding Strips for Slides, per 100	**20**
Thin Crystal Cover Glass, 3¼ x 4, per dozen	**40**

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Stamp Portrait Outfits.

Patented July 12th, 1887.

The original and only one manufactured under the Kuhn patent. I have concluded to put them on the market at the following **low prices**, and am now prepared to receive orders.

Stamp Photo Size, for 25 on 5 x 7 Plate, - -	**$50 00**
Minette " " " 8 " 5 x 8 " - -	**40 00**
Perforators, - - - - - - - - - -	**35 00**

To those who do not feel disposed to purchase a right, with apparatus, etc., we will furnish the Stamp Portraits at the following prices :

100 Stamp Photos,	**$1.00**	**1,000 from one picture,**	**$7.00**
500 from one picture,	**4.00**	**10,000 " " "**	**50.00**

For larger orders, special agreements. No less than 100 made from one subject.

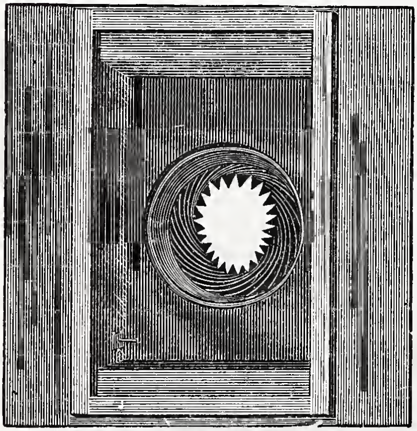
In lots of 1,000 or more, we photograph any name or autograph free of charge ; on less than 1,000 an extra charge of $1.00 will be made.

Photographers please make your own prices, as these prices are net.

THE NEW MAGIC VIGNETTER,

—— FOR ——

Producing the Black Background or Ebony Photographs.



Patented May 31, 1887.

Hundreds of these Vignetters are now in use, GIVING UNIVERSAL SATISFACTION. They can be easily adjusted to any camera, and require no more trouble or expense than making plain photographs. Every one guaranteed.

PRICE, EACH, $8.00.

To get the best results with the Magic Vignetter it is necessary to use a black felt ground, so placed that it will reflect no light in the Camera. We have secured a superior felt for this purpose, which we can furnish at the following prices

SIZE, 3 x 3	$0 80
" 3 x 6	1 50
" 4 x 6	2 00
" 6 x 6	3 00
" 6 x 8	4 00
" 6 x 10	5 00

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Portrait Euryscopes,

THE IDEAL PORTRAIT LENSES.

And the Celebrated EURYSCOPE LENSES for Standing Figures, Groups, Large Heads. Landscapes, Instantaneous Views, etc.,

Now constructed of new Jena Glass, specially made for Voigtländer; the favorite Lenses of Amateurs. Unrivalled for Detective Cameras.

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Send for Price List of Lenses and our other Specialties.

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ACTIONS SPEAK LOUDER THAN WORDS.

AT the **Tenth Annual Convention of the P. A. of A.**, held at Boston, August 6th to 10th, 1889, the **NEW EAGLE PLATE** told its own story by carrying off more gold and silver medals than any other Plate. The awards in class A for the four best exhibits in Genre photography were four gold medals, and of which the New Eagle carried away three:

O. P. SCOTT, of Chicago, **Gold Medal**, his exhibit was made on the New Eagle only.
S. L. STEIN, of Milwaukee, **Gold Medal**, his exhibit was made on the New Eagle only.
G. M. ELTON, of Palmyra, N. Y., **Gold Medal**, the greatest and best part of his exhibit was made on the New Eagle.

The awards in class B were one gold and two silver medals; of these the Eagle carried away the gold and one silver medal:

L. M. BAKER, of Columbus, **Gold Medal**, the best part of his exhibit was made on the Eagle.
J. HY. DOERR, of Louisville, **Silver Medal**, his exhibit was made on the Eagle only.

THE NEW EAGLE PLATE

has been manufactured and placed upon the market since December 1st, 1888, without having had a single failure up to date. The Plates run **Uniform and Clean.** Their **Ease in Development, Brilliancy, Fine Gradation** and **Full Density**, combined with **Rapidity**, give negatives of a rare beauty seldom attained by any other plates.

To substantiate the above we have testimonials from the leading photographers all over the United States, and who are all using our Plate.

If you have not had any of the **Wuestner's New Eagle Plate,** then send in a trial order and convince yourself. When ordering from stock houses see that you get **WUESTNER'S NEW EAGLE DRY PLATES.**

Yours fraternally,

WUESTNER'S NEW EAGLE DRY PLATE WORKS.

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The
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respectfully announce
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Where greatly increased facilities will enable them to meet the demands of their trade with promptness.

May 1st. 1889 **J·E·Rhodes.**

Take Elevator at Entrance.
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Vest Camera in position for Time Exposure.

Our Cameras Photograph the World.

OVER 16,000

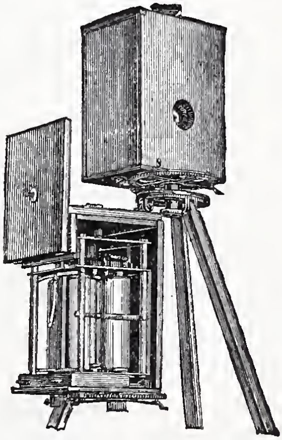
SOLD SINCE OCTOBER, 1886.

Wonderful Photographic Inventions.

C. P. STIRN'S PATENT

Concealed Vest Cameras

With the New Shutter for Time and Instantaneous Exposures, in a handsome polished Black Walnut, Plush-lined Carrying Case.



SIZE No. 1, 6 in. Diameter, 1 lb. in Weight, fine Nickel-plated Apparatus, with 6 Plates for 36 Pictures, 1¾ in. Diameter, **$10.00.**

SIZE No. 2, 7 in. Diameter, 1¾ lb. in Weight, with 6 Plates for 24 Pictures, 2½ in. Diameter, **$15.00.**

This Camera is carried under the coat or vest, invisible to the eye, and is always ready and in focus.

Any one can make his own pictures with our Cameras. Send for new 56-page Illustrated Catalogue, free, or stamp for specimen Vest Camera Photograph, to

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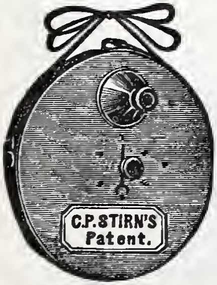
No. 20 Park Place, New York, U. S. A.,
Sole Agents for the United States and Canada.
Also for sale by all Photographic Stock Dealers.



Concealed Camera as carried under the Vest.

Our New Panoramic Camera, "The Wonder,"

JUST OUT.

Size of Box, 4x4x6 in., makes pictures 3¼ in. wide, 18 in. long, **$30.00.**

Dr. Backelandt's Patent Self-Developing Dry Plates,

Develop in Water without a special Developing Bath.

Star Tripods, 60c. and $1.50 each.
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We bring out new inventions and specialties every month.

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Perfect Lined Screen Plates

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HALF TONE PHOTO-ENGRAVING.

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RULED ABSOLUTELY PERFECT.

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INVESTIGATE THIS:

One Pair Line Plates, 8 x 10,	**$10.00**
Instructions in use of same,	**40.00**

My Line Plates are in use by some of the FINEST ENGRAVERS in the United States. For full particulars and samples of work send 10 cents for postage to

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FOLDING CAMERAS. Elegantly finished; rigid; compact.

PORTABLE CAMERAS (Detective). Can be taken out of case and used on tripod.

PARSELL'S PORTABLE CAMERAS with fixed focus. Always ready.

RAPID HOMOLOGRAPHIC LENS. For all work where quick exposure is required. Equal to the best, and at less price.

WIDE-ANGLE LANDSCAPE LENS. Unequalled in perspective for Landscapes, for confined situations, architectural subjects, interiors or copying; are rectilinear and 30 per cent. more rapid than any other with same diaphragm.

SINGLE LANDSCAPE LENS. For view work are unsurpassed by the more costly lenses.

DIAMOND SHUTTER. Time and instantaneous. Adding 25 per cent. to cutting quality of any lens, the shutter is also the diaphragm, smaller lenses than the original can be fitted by using adapters.

MAGNESIUM (Flash) LAMP. Three grains pure Magnesium will fully expose an 8 x 10 plate.

THE PHOTO-OPTICON. The best projecting instrument made.

SINGLE, DOUBLE, TRIPLE OR VERTICAL,
For oil or oxy-hydrogen gas.

HIGH PRESSURE KEY. **MICROSCOPE PROJECTING ATTACHMENT.**

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CAMERAS, LENSES, LANTERNS, ETC.,
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FREE OF ALL CHARGE.

All Americans whether Amateurs or not are cordially invited to call and inspect their Studios and Dark Rooms, which are fitted with every convenience that art can need or money supply.

Every Amateur should inspect THE STEREOSCOPIC CO.'s immense stock of **Cameras, "Black Band"** and other Lenses, **Dry Plates** of all sizes and makes, **Instantaneous Shutters, Tripod Stands, Traveling Tents** and particularly their magnificent stock of **Detective** and **Hand Cameras** which is without exception the finest in the world.

For particulars of the Co.'s "BLACK BAND" Lenses, see opposite page.

THE STEREOSCOPIC CO.,
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CARBUTT'S FLEXIBLE FILMS.

THE LONDON STEREOSCOPIC & PHOTOGRAPHIC CO.,
Limited,
106, 108 & 110 Regent St., W., & 54 Cheapside, E.C.

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New Regd.

"BLACK BAND"

LENSES.

THE *British Journal of Photography*, says, respecting these Lenses:—"One, a rapid 'Euryscope,' possesses an intensity, power, or angular aperture equaling $f/6$ with the largest diaphragm. This, it will be seen, relegates it to the position of being a lens suitable for studio portrait work: and, under these conditions, it is almost unmanageably rapid for out-of-door scenes—especially with quick plates. But the second diaphragm, $f/8$, renders it quite amenable to a quick shutter, even on a bright day; while, by those of smaller sizes, the greatest degree of depth can be obtained. THE CORRECTION OF THIS LENS IS MOST EXCELLENT, both as regards achromatism and aplanatism.

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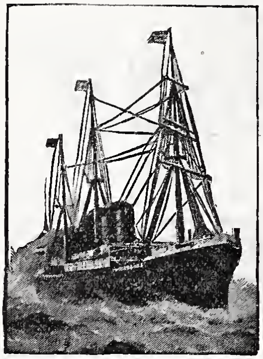

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THE

New French Albumen Paper.

STEAMER BRAND.

This is a Double Albumenized Paper which has been pronounced by leading artists superior to any they have ever used.

Mr. Falk, the well-known New York Photographer, says:

GENTLEMEN:—The New Albumen Paper, Steamer Brand, prepared by Schaeffner, of Paris, and sold by you, has received an ample test at my gallery and *has scored an unqualified victory.* It prints with better clearness in the high lights and with more luminous detail throughout than any paper I have used for years. If the present high standard of quality possessed by the paper will be maintained, you may regard me as a steady customer and one who wishes you all success, Yours truly,

FALK.

Opinion of Mr. Kurtz on the new Paper.

GENTLEMEN:—I state with pleasure that your New Albumen Paper, Steamer Brand, gives me great satisfaction. I prefer it to all other papers. Yours,

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The optical factory of C. Berthiot, in Paris, is one of the oldest and most celebrated establishments of its kind, whose work has long since become famous far beyond the limits of France. We offer the Extra Rapid Aplanat, the Wide Angle Aplanat, the Rapid Aplanat, the New Triplex Aplanat (a new interchangeable combination objective), the Angle Aplanat for double focus, Aplanats for Stereoscopic work, combination Objectives for postage stamp portraits, Rapid Objectives à Vannes, the Perigraph (comprising 105°), Simple Objectives for Landscape, etc., etc., and call special attention to an improvement of great value which our objectives possess in being provided with the Iris Diaphragm. This invention does away with the cumbersome stops hitherto used, a simple turn of the screw being sufficient to enlarge or reduce the aperture. These lenses are equal to the best in the market and are offered to the public at very reasonable prices.

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(MORGAN'S PATENT).

This machine carries eight backgrounds in such a manner that any one of them can be unrolled at a moment's notice. It occupies little space and has proved a source of pleasure to all operators who used it, where formerly they experienced only drudgery and waste of time

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Made of cardboard of superior quality, with new and artistic designs on the reverse.

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The newly discovered Developer for Dry Plates and Paper. Superior to Pyro, Hydrochinon, Oxalate, or any other Developer.

TRY EIKONOGEN and you will use NO OTHER Developer.

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Invented by Ottomar Anschuetz of Lissa, Prussia, the celebrated inventor of that wonderful electro-photographic apparatus, the Tachyscope. Having secured the American Rights for this Camera, we now manufacture it in best style. It is undoubtedly the best, most compact and convenient camera for instantaneous in- and out-door work ever constructed.

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ORTHOCHROMATIC (Eosine-Silver) PLATES.

Invented by PROF. VOGEL AND DR. OBERNETTER.

These plates are used without yellow glass screens, and give most astonishing results in the graduation of light and shade.

GERMAN GRADUATED BACKGROUNDS.

(EAGLE STANDARD BRAND).

These Backgrounds are painted in three different tints, in order to enable photographers to have the necessary grounds both for light or dark colors of dresses. They are shaded according to right or left light in the studio, also for use on either side. Our Backgrounds make the figure the only subject in the photograph. They do not draw the attention away, as scenic or fancy effects do. They do not look like Backgrounds, and they lend softness and transparency to the whole picture.

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ARTISTIC FURNITURE FOR PHOTOGRAPHERS.

We have a large selection of the most beautiful specimens of Artistic Furniture manufactured in Paris, Venice, Vienna and Berlin. They are made of oak and walnut, splendidly carved in different styles, and carefully upholstered wherever necessary. The selection includes all kinds of Chairs and Stools, Tables, Screens, Combination Desks, Pianos, etc., Stairs, and so forth. We also have a fine stock of decorative articles made of Papier-maché. We sell all these goods at reasonable prices.

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For Bromide and Chloride of Silver Paper.

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This machine does away with the tedious method of sun-printing, enabling an operator to print 400 copies per hour.

The

Bradfisch Sensitized Aristotype Paper

IS UNEXCELLED.

THIS paper is claimed to give finer results than any other Aristo-Collodio-Chloride, or the best Albumen paper ; it prints **quicker, softer** and **richer** than these and renders all the fine details of the negative ; it will keep the high-lights and half-tints without requiring the shadows to be overprinted. Negatives of ordinary strength, as used for Albumen printing will give surprising results, but fine prints are also obtained from thin or dense negatives. This paper will not **curl, crack** or **frill** under any circumstances ; it will also not stretch and cause distortion. Nothing can exceed the beauty of the prints, which are toned and fixed without previous washing in our combined baths (formula for same given in directions). Any desirable tone, ranging from the richest sepia brown to the velvety black, with remarkably pure whites, can be obtained in this bath, requiring less care and labor than any other method. The surface of the prints may be rendered faint or brilliant by burnishing or glacing them. If protected from the actions of light, air and dampness, the paper will keep its good quality for four months or longer.

We would request all photographers, professional or amateur, who are desirous of keeping in the van of progress, to give this fine paper a trial, its cost being not higher than that of Albumen paper, figuring time, labor and materials for silvering.

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Size.	Per Dozen.	Per Gross.
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4 x 5	0 20	......
4 x 6	0 25	$2 00
5 x 7	0 35	3 50
5 x 8	0 40	4 00
6½x 8½	0 60	......
8 x10	0 75	......
20 x24	3 00	0 30 per sheet.

Full and explicit directions in each package.

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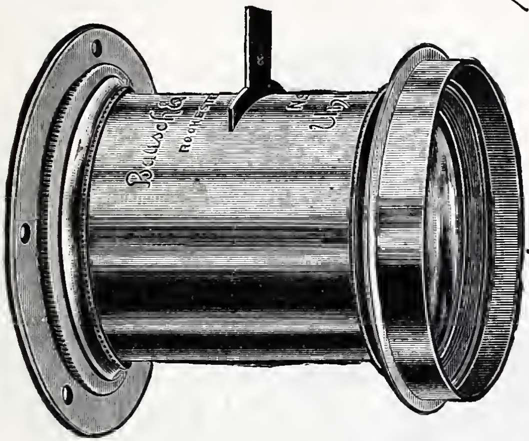

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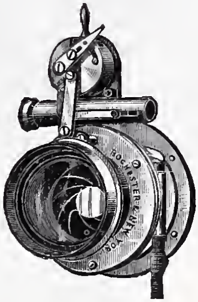

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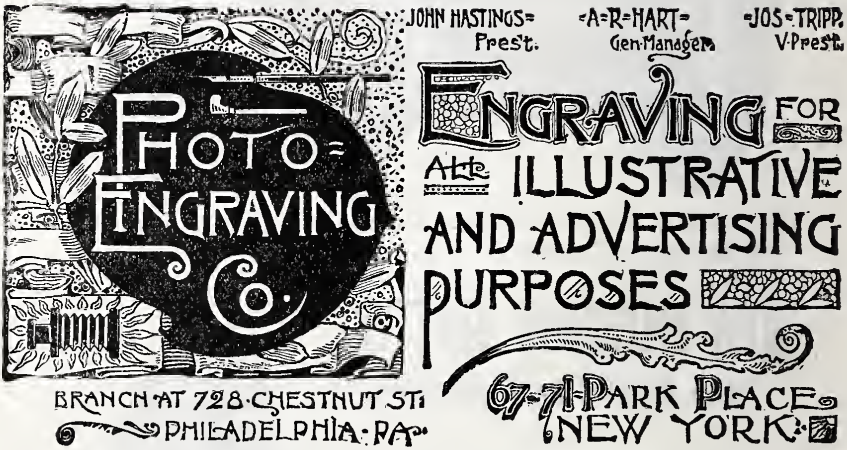

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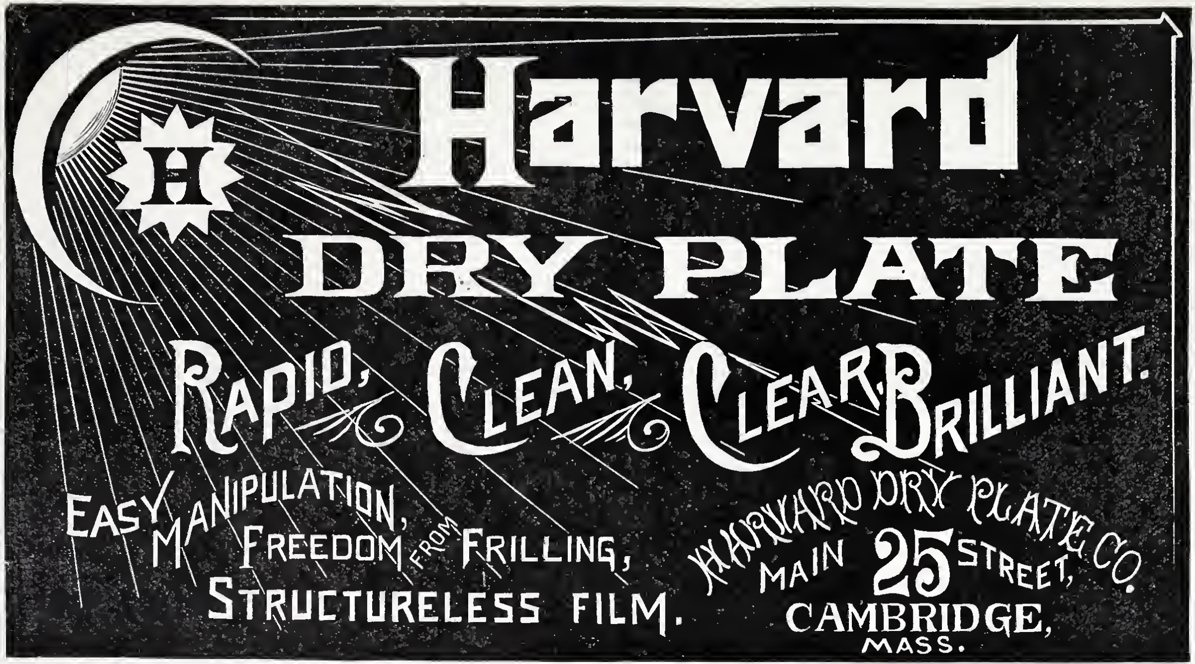

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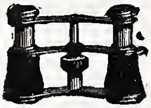

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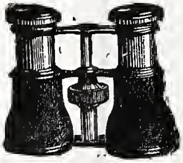

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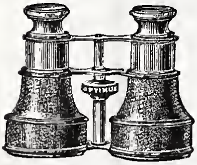

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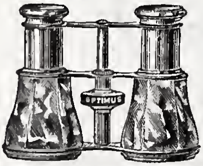

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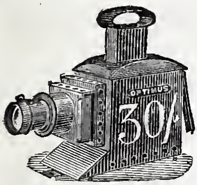
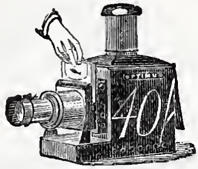
Adapted for use with Lime Light. For Dissolving, two Lanterns are necessary.

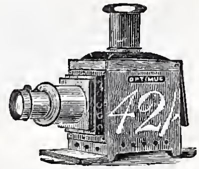
Each Magic Lantern is efficient for exhibitions. The Lens gives crisp definition, being a superior Achromatic Photographic Combination (large diameter black lens), with rack and pinion. It is fitted to a telescopic lengthening tube, so gaining increased focal accommodation The Condenser is composed of two plano-convex lenses of 4 inches diameter. The refulgent lamp has 3 wicks (or 4 wicks, 2*s*, extra), yielding a brilliantly illuminated picture. Each is complete in box.



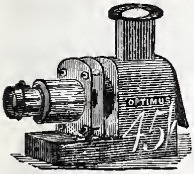
Japanned Metal, **30***s*.



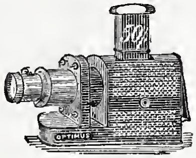
Student's Lantern (to take demonstrating tank) finished Brass Sliding Tubes, **40***s*.



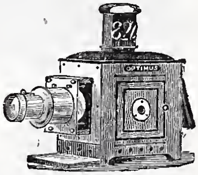
Mahogany outside Body. Japanned Metal Stages and Sliding Tubes, **42***s*.



Russian Iron Body. Brass Sliding Tubes, **45***s*.



Perforated Russian Iron Body. Brass Sliding Tubes. **50***s*.



Mahogany outside Body, 2 Panelled Doors. Brass Stages and Sliding Tubes, **82***s*.

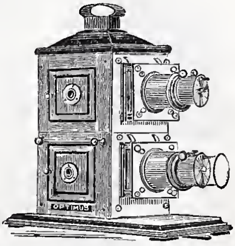
'OPTIMUS' BI-UNIAL LANTERN. For Lime Light.

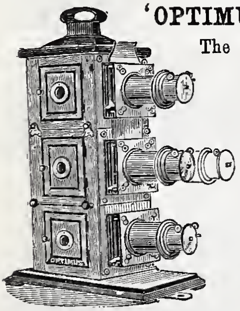
The Top Lantern may be used separately with Oil Lamp.

Panelled Mahogany Body, and Moulded Foot, picked out with black, Japanned Stages and Tubes, Achromatic Photographic Front Lens, Compound Condensers, £5 **12 0**.

Do., do., with Brass Stages and Sliding Tubes, £8 **8 0**.

If fitted with 3-draw Telescopic Tubes and 4 extra Front Lenses, £6 6s. Two Gas Jets, 30s. Dissolving Tap, 17s.





'OPTIMUS' TRIPLE LANTERN.

FOR LIME LIGHT.

Panelled Mahogany Body, Moulded Foot, picked out with black, Brass Stages and Tubes Achromatic Front Lenses, Compound Condensers, £**14 10***s*.

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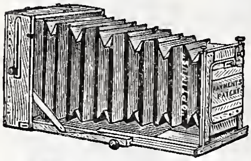
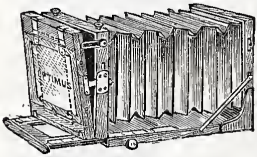


RAYMENT'S Patent CAMERA (Long Focus).

Price includes 3 Double Dark Slides.

4¼ by 3¼	6½ by 4¾	8½ by 6½	10 by 8	12 by 10
120*s.*	**145*s.***	**168*s.***	**212*s.***	**258*s.***

"The 'Rayment' Camera in particular claims attention, both for its BEAUTY of WORKMANSHIP and for the EASE and READINESS with which it can be put into action.—*The Camera.*

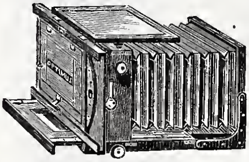


'OPTIMUS' CAMERA (Long Focus).

Price includes 3 Double Dark Slides.

4¼ by 3¼	6½ by 4¾	8½ by 6½	10 by 8	12 by 10
112*s.*6*d.*	**131*s.***	**161*s.***	**227*s.***	**275*s.***

"I should strongly recommend Rayment's Camera. It is LIGHT, COMPACT, very RIGID, and extends to about double the usual focus."—*Amateur Photographer.*

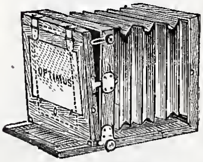


'OPTIMUS' STUDIO CAMERA (Long Focus).

With Repeating Frame, Masks, and 1 Single Dark Slide, Back Focusing and Swing.

4½ by 6½	8½ by 6½	10 by 10	12 by 12	15 by 15
145*s.*	**188*s.***	**225*s.***	**265*s.***	**325*s.***

"Invited to say if, in our estimation, the Studio Cameras of Perken, Son & Rayment could be improved in any way whatever for the purpose for which they are intended, we must answer No!"—*British Journal of Photography.*



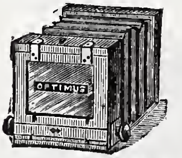
PORTABLE (A. R.) CAMERA.

Compact, Rigid, Inexpensive, and of Excellent Finish.

This Instrument has Leather Bellows, and is fitted with hinged Focusing Screen, adjusted by Rack and Pinion, Square Reversing Back, so that horizontal or vertical pictures may be taken without removing Camera from Stand. (Double Swing).

Price of Camera, includiug 3 Double Dark Slides.

4¼ by 3¼	5 by 4	6½ by 4¾	8½ by 6½	10 by 8	12 by 10	15 by 12
102*s.*	**104*s.* 9*d.***	**118*s.***	**146*s.*3*d***	**174*s.*6*d***	**216*s.***	**274*s.*6*d***

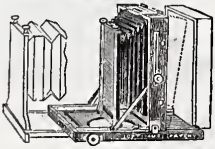


'OPTIMUS' PORTABLE FOLDING CAMERA.

Cheap, Strong, Serviceable and Efficient.

Durable Bellows, hinged Focusing Screen with sliding adjustment, readily and securely held in exact position by means of a pinion passing through the body nearest bottom or base board, and having milled head screws on either side of the instrument to clamp tight. Camera and 1 Double Dark Slide.

4¼ by 3¼	5 by 4	6½ by 4¾	8½ by 6½
21*s.*	**24*s.***	**39*s.* 6*d.***	**48*s.***



WIDE-ANGLE CAMERA (Long Focus).

Price, including 3 Double Dark Slides.

4¼ by 3¼	5 by 4	6½ by 4¾	8½ by 6½	10 by 8	12 by 10	15 by 12
140*s.*	**146*s.***	**165*s.***	**188*s.***	**235*s.***	**288*s.***	**350*s.***

This Instrument possesses every possible advantage, being very light, very rigid and very portable. The Focusing Screen and body may be brought towards the front of baseboard so as to prevent obstruction when using lenses of wide angular aperture and short focus. It is provided with double-swing arrangement and long focusing (rack) adjustment. When closed the lens may remain attached to its proper position (the front) and project through the turntable in the baseboard.

99 Hatton Garden, London, E. C.

Estab. 1852. **PERKEN, SON & RAYMENT,** Catalogue Free.

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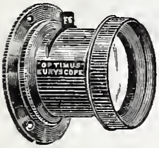


'OPTIMUS' RAPID EURYSCOPE.

The Aperture is F/6. The Lenses are of Special Optical Glass, constructed with the nicest precision of curvatures, so maintaining good marginal definition, coupled with the most extreme rapidity.

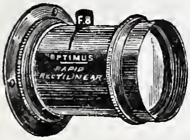
$\frac{5}{4}$	$\frac{7}{5}$	$\frac{8}{5}$	$\frac{9}{7}$	$\frac{10}{8}$
63*s*.	**94*s*.6*d*.**	**110*s*.**	**126*s*.**	**220*s*.**

WIDE-ANGLE EURYSCOPE (Double) *F*/9·50.

This Aperture is exceedingly open for wide angle work. The definition, however, is in no way sacrificed, as the curvatures are most perfectly accurate, and the most minute detail in architectural and interior subjects is rendered with the maximum of crispness, and a total absence of distortion.

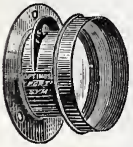
To cover....................	5 by 4	7 by 5	9 by 7	10 by 8	
Equivalent Focus..........	4¼	5½	7	7¾	inches.
	63*s*.	**94*s*.6*d*.**	**126*s*.**	**220*s*.**	

'OPTIMUS' RAPID RECTILINEAR.



Second only to the above for Rapidity, therefore well suited for instantaneous effects, out-door groups and views, as well as interiors; copying and enlarging are also within the capabilities of this lens—in fact its work may be styled Universal.

$\frac{5}{4}$	$\frac{6}{5}$	$\frac{7}{5}$	$\frac{8}{5}$	$\frac{9}{7}$	$\frac{10}{8}$	$\frac{12}{10}$	$\frac{15}{12}$	$\frac{18}{16}$
33*s*	**45*s***	**49*s* 6*d***	**64*s***	**82*s* 6*d***	**127*s* 6*d***	**142*s* 6*d***	**180*s***	**225*s***

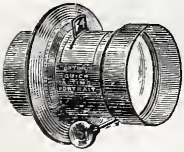


'OPTIMUS' WIDE-ANGLE SYMMETRICAL.

Specially adapted for Architecture.
Can be used to advantage when very close to the subject.

$\frac{5}{4}$	$\frac{7}{5}$	$\frac{9}{7}$	$\frac{10}{8}$	$\frac{12}{10}$	$\frac{15}{12}$	$\frac{18}{16}$
39*s*.	**52*s*. 6*d*.**	**82*s*. 6*d*.**	**127*s*. 6*d*.**	**142*s*. 6*d*.**	**180*s*.**	**225*s*.**

'OPTIMUS' QUICK-ACTING PORTRAIT.



Specially constructed for short exposures in Portraiture. They are second to none, definition being maintained by their perfect optical qualities.

Diameter......	2 inches.	2¾ inches.	3½ inches.
Price..........	**90*s*.**	**120*s*.**	**180*s*.**
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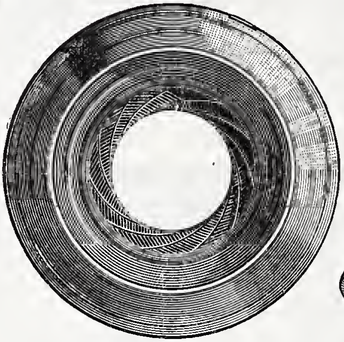

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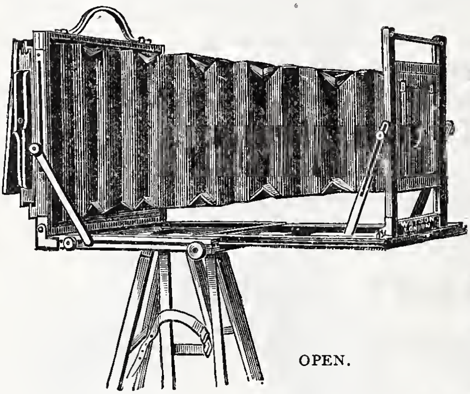
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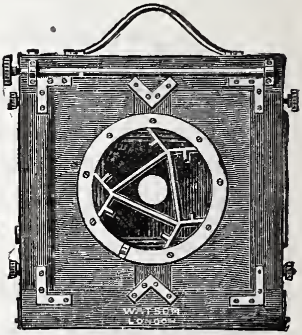

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Solid Leather Traveling Case with Spring Lock..	1 15 0	1 15 0	2 2 0	2 10 0	3 0 0	3 15 0
Rotating Turntable in base and Tripod Stand..	2 2 0	2 2 0	2 2 0	2 10 0	2 15 0	3 3 0
Instantaneous Shutter....	18 0	18 0	1 1 0	1 4 0	1 4 0	1 10 0
Extra if Camera and Slides are Brass Bound........	1 10 0	1 10 0	1 15 0	2 0 0	2 10 0	3 0 0
	19 17 0	20 15 0	24 5 0	28 14 0	34 6 0	42 18 0

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Solid Leather Traveling Case with Spring Lock.	1 15 0	2 10 0	3 0 0	3 15 0
Rotating Turntable in Base and Tripod Stand ..	2 2 0	2 10 0	2 15 0	3 0 0
Instantaneous Shutter..........................	18 0	1 4 0	1 4 0	1 10 0
Extra if Camera and Slides are Brass Bound....	1 10 0	2 0 0	2 10 0	3 0 0
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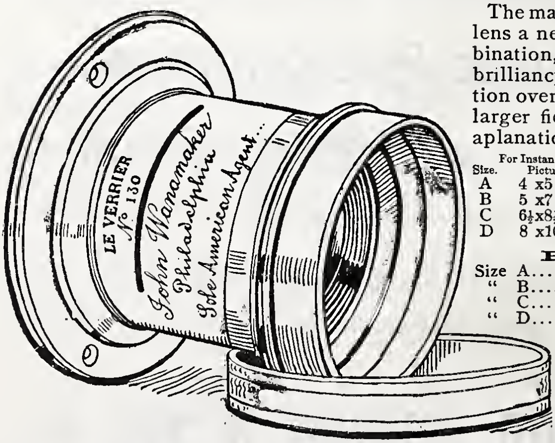

The maker claims for this lens a new aplanatic combination, giving greater brilliancy and illumination over a proportionately larger field than in other aplanatic lenses.

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PRICE.

Size	A	$17.00
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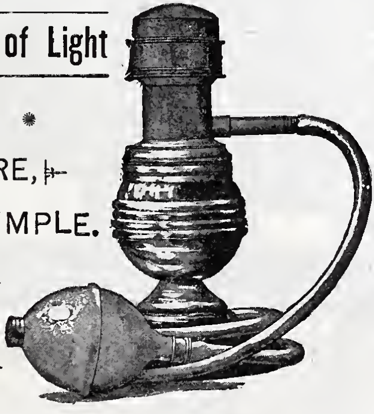

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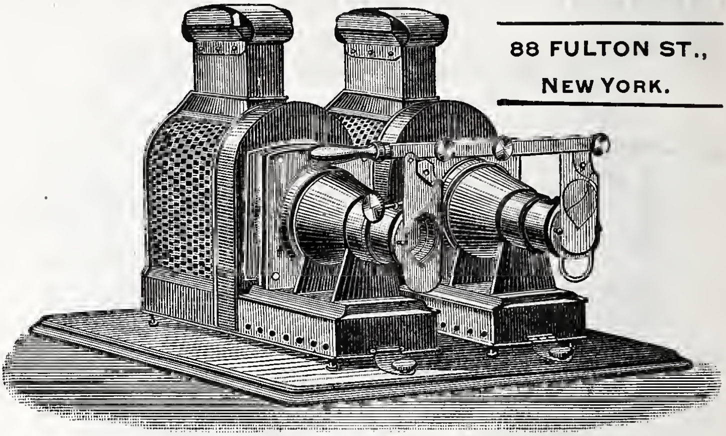

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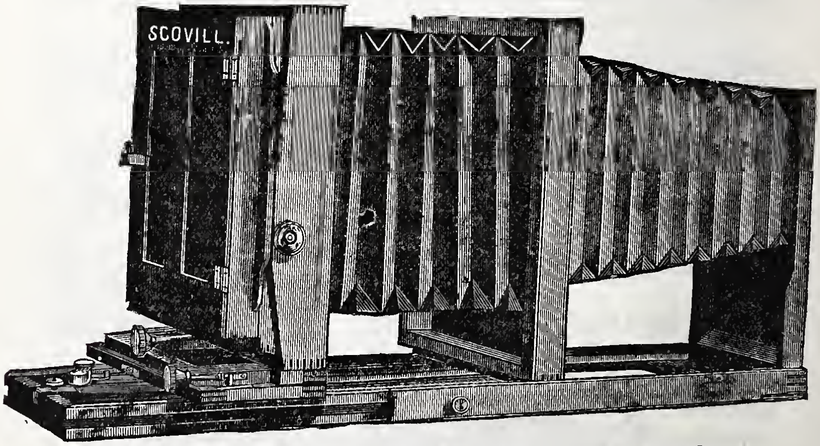

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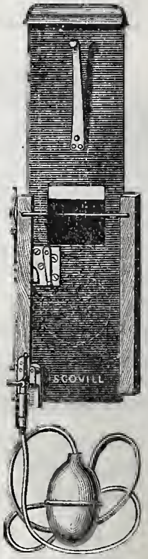

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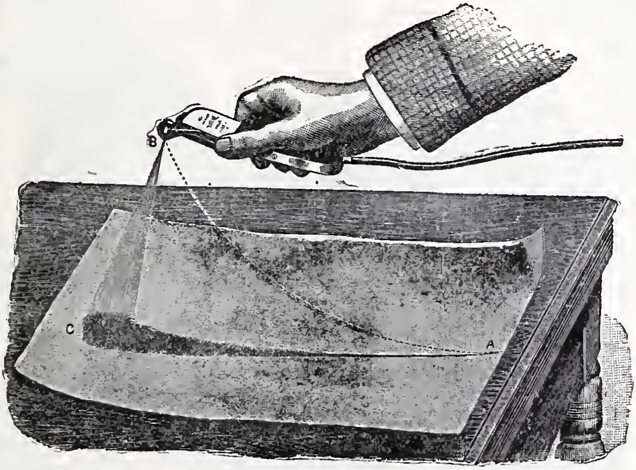

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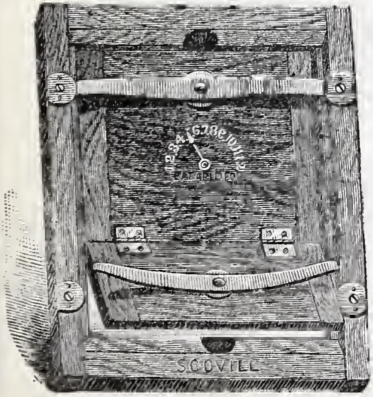

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They are so constructed that a uniform pressure is obtained, thus insuring perfect contact between the paper and the negative, and removing the danger of breaking the latter.

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6½ x 8½	60	1 25
8 x10	75	1 60
10 x12	1 00	2 00
11 x14	2 00	2 50
13 x 16	$2 25	$2 75
14 x 17	2 45	3 00
16 x 20	4 50	4 75
17 x 20	4 50	4 75
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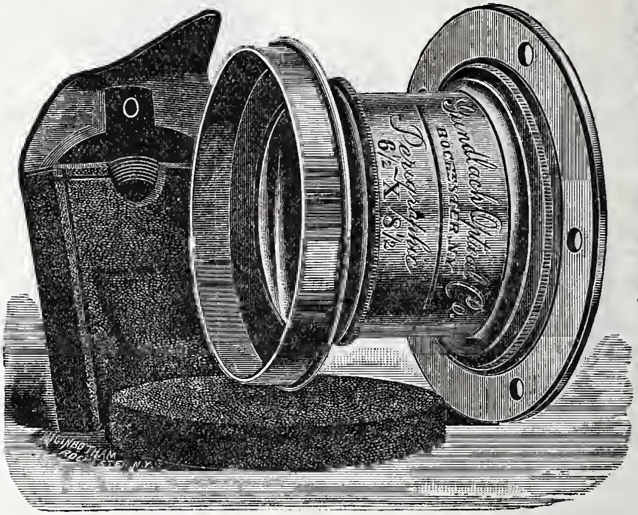

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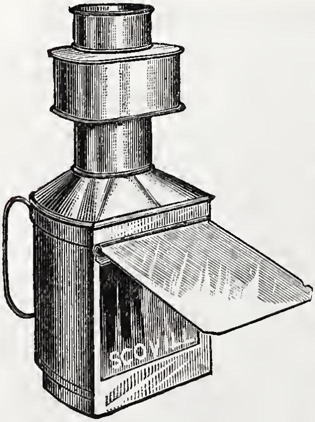

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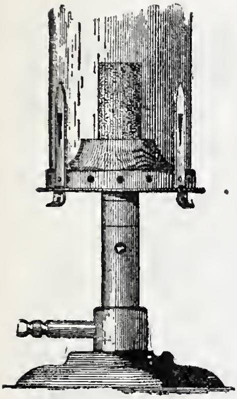

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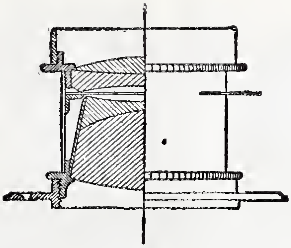

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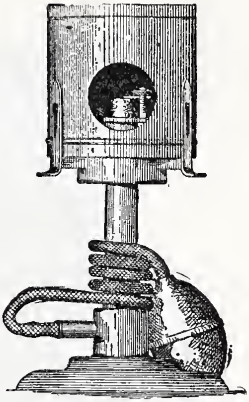

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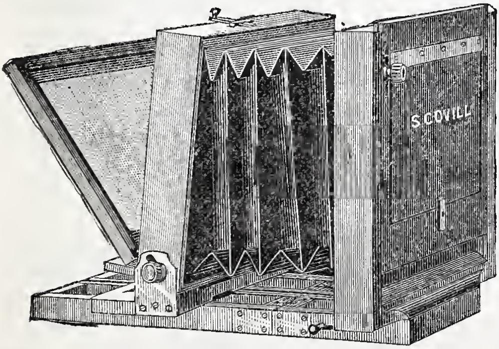

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4x5 Waterbury Outfits, Complete **$12 00**

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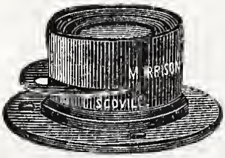

Patented May 21, 1872.

These Lenses are absolutely rectilinear; they are the most rapid, and are universally conceded to be the BEST WIDE-ANGLE LENSES MADE.

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6	1 "	8 x 10 "	8 " "	30 00	
7	1¼ "	11 x 14 "	10½ " "	40 00	These 2 sizes will fit into 1 flange.
8	1¼ "	14 x 17 "	14 " "	50 00	
9	1½ "	17 x 20 "	17 " "	60 00	These 3 sizes will fit into 1 flange.
10	1½ "	20 x 24 "	22 " "	80 00	
11	1½ "	25 x 30 "	28 " "	100 00	

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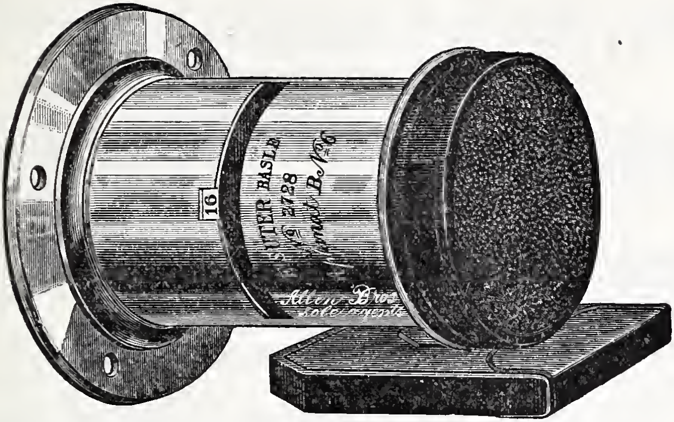

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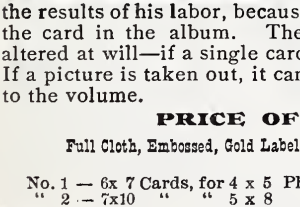
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Morocco, Half Leather, Extra Gold Finish, with A. M. Collins Manufacturing Co.'s Cards. Boxed.

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" 6	— 8x10 "	" 6½x 8½ "	2 75	" 12— 4 00
" 7	—10x12 "	" 6½x 8½ "	3 50	" 13 - 4 75
" 8	—11x14 "	" 8 x10 "	4 00	" 14— 5 50
" 9	—14x17 "	" 10x12 or 11x14	5 50	" 15— 9 00
" 10	—16x20 "	" 11x14 or 14x17	7 75	" 16—11 00

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Reduces density in negatives and positives on glass or paper. Can be applied locally to remove halation marks, ghosts, etc.

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The Third Edition of the Amateur Photographer contains, besides the above, an account of the more important novelties to which attention has been directed during the last two or three years, such as the **Magnesium Flash Light, Secret and Detective Cameras.** New and reliable methods of **Intensifying the Gelatine Plate, Ortho-Chromatic Photography**, etc., etc.

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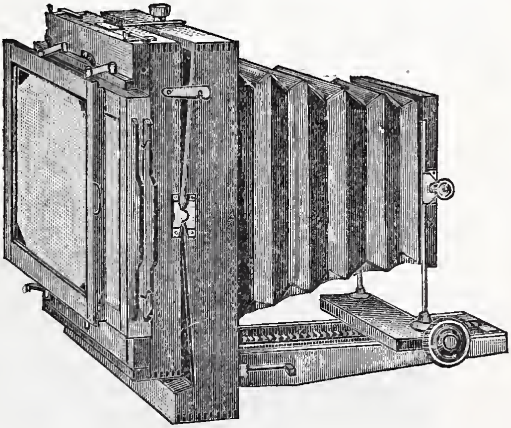
AMERICAN OPTICAL CO'S Star View CAMERAS.

(PATENTED.)



The Star Reversible Back Cameras have the patent reversible back, with automatic latch, which allows Holder to be inserted without holding back the ground-glass frame, the rack and pinion movement, and the *patent latch* for making the bed rigid instantaneously.

Each Camera is supplied with one Daisy Holder with *patent Registering Slides* and canvas case.

STAR REVERSIBLE-BACK CAMERAS.

	Single Swing-back.	Double Swing-back.
No. 110— 4 x 5	$25 00	$29 00
" 111— 4¼ x 5½	26 00	30 00
" 112— 4¼ x 6½	30 00	34 00
" 113— 5 x 7	32 00	35 00
" 114— 5 x 8	34 00	38 00
" 115— 6½ x 8½	36 00	40 00
" 116— 8 x 10	40 00	44 00
" 117—11 x 14	60 00	64 00

THE

Tom Thumb Camera.

The Cheapest, Smallest, and Most Compact Detective Camera in the market.

MAKES EITHER A ROUND OR SQUARE PICTURE.

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Plates, 2½ Cents Each (Size 2⅝ inches Square.)

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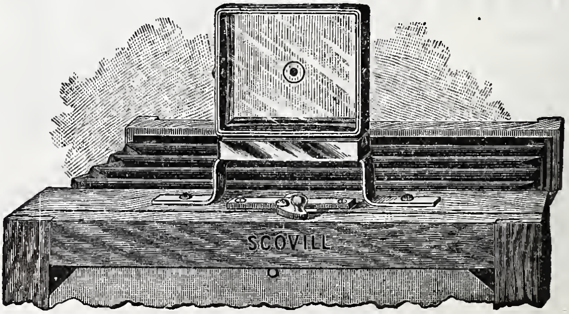
SCOVILL MAGIC FINDERS,

(PATENTED.)

Unequaled for Landscape Photography.



One sees through them a marvelously clear *non-reversed* image *the exact proportion* of the reversed one on the ground-glass. The Magic Finders are light, ornamental, easily adjusted and detached, and pronounced a great convenience by view takers.

PRICE LIST.

No. 1, for 4x5 Camera	$1 50	No. 3, for 6½x 8½ Camera	$2 25
" 2. " 5x8 "	1 75	" 4, " 8 x 10 "	2 75

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ECONOMIC LENSES.

These Lenses are intended to fill the want experienced by thousands of successful workers with the Waterbury Lens, for a good, low-priced Rectilinear Wide-Angle Lens, whereby they can gain artistic effects in perspective at short distances.

The working qualities are much higher when compared with the finest lenses of this kind, than the low price indicates.

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No.	Size of Plate.	Back Focus.	Equivalent Focus.	Price.
3	6½ x 8½	6 inches.	6½ inches.	$18 00
4	8 x 10	8 "	8½ "	22 00

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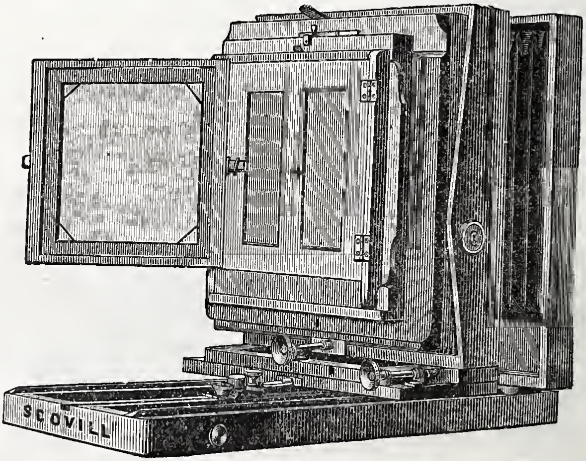

Boston Imperial Cameras.

The 11 x 14 Boston Imperial Camera is the same as an 11 x 14 Portrait Camera, with the addition of an 8 x 10 Carriage and an 8 x 10 Holder, and is used to make two imperials on an 8 x 10 or 4-4 plate, using one 4-4 lens · two cards on a 5 x 8 plate, using one 1-2 size lens; two large panel pictures, 6 x 10 inches in size, can also be made, and regular work from 11 x 14 to 1-4 inclusive. All with Double Swing-back and Waterbury Holder.

No. 30.—11x14	Boston	Imperial	Camera,	with	8x10	attachment	and holder,	$ 85 00
" 31.—14x17	"	"	"	"	8x10	"	"	100 00
" 32.—17x20	"	"	"	"	8x10	"	"	110 00
" 33.—18x22	"	"	"	"	8x10	"	"	120 00
" 34.—20x24	"	"	"	"	11x14	"	"	140 00

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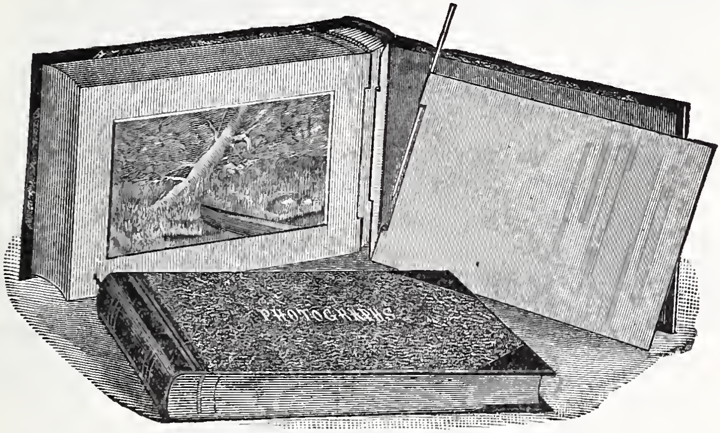
WITH INTERCHANGEABLE LEAVES.

(PATENTED.)



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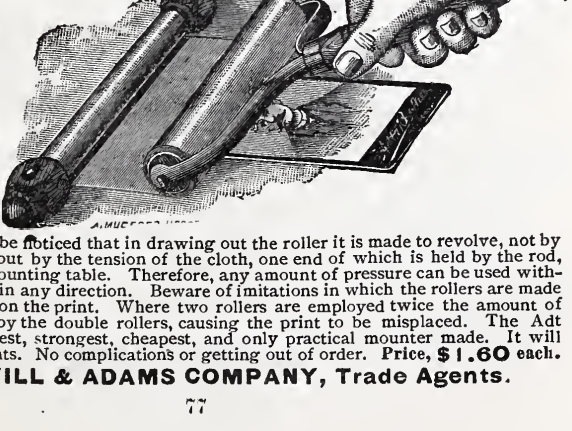

Consists of a spring roller, to which is attached a handle, and upon which is wound a band of fine cotton cloth, one end of the band being fastened to a rod, which is screwed to the mounting table. After the pasted print has been placed upon the mount, the roller is drawn over the print, as shown in the cut, the spring roller drawing the cloth band perfectly tight, and re-winding it when the roller returns. The uniform pressure of the roller removes all the air from under the print and presses it securely to the mount. It absorbs the moisture from the surface of the print leaving it perfectly smooth. The band is of sufficient length so that when, in time, a portion of it becomes soiled, it can be wound upon the removable rod, which is fastened to the table thereby exposing a clean surface. When the entire band becomes soiled, it may be removed, washed and replaced. It will be noticed that in drawing out the roller it is made to revolve, not by friction on the print, but by the tension of the cloth, one end of which is held by the rod, and screwed to the mounting table. Therefore, any amount of pressure can be used without moving the print in any direction. Beware of imitations in which the rollers are made to revolve by friction on the print. Where two rollers are employed twice the amount of friction is produced by the double rollers, causing the print to be misplaced. The Adt Mounter is the simplest, strongest, cheapest, and only practical mounter made. It will mount all sizes of prints. No complications or getting out of order. **Price, $1.60 each.**

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PRINTING, DEVELOPING AND ENLARGING

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PRACTICAL INSTRUCTION IN PHOTOGRAPHY

Is now made possible to every beginner and student in the Art-Science through the

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Either by direct personal instruction at the CHAUTAUQUA ASSEMBLY GROUNDS, in Summer; the local classes at the School's Head-quarters, New York City, during the Autumn, Winter and Spring; or by the corresponding classes, through printed lessons and the Organ of the school. A post-graduate class has been opened October 1st, 1889.

The Summer School for 1890 will open at Chautauqua on or about next July 1st with two classes.

SUBJECTS OF INSTRUCTION.

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Students are admitted to the Corresponding Classes at any time from October 1st to May 1st.

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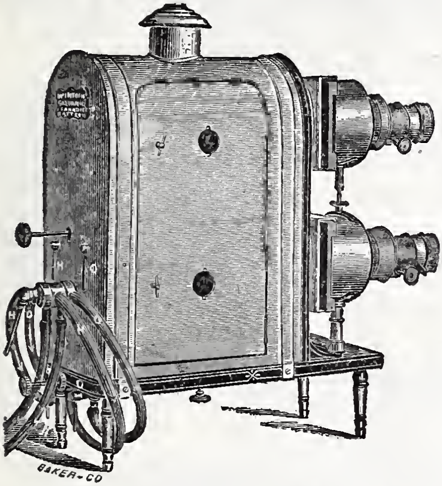

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TRANSPARENCIES

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Coloring LANTERN-SLIDES a Specialty.

Send three cents for catalogue.

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Three-Crown Albumenized Paper

Used by MORA, FREDERICKS, ANDERSON, MORENO and LOPEZ, and the leading Photographers of this country.

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UNDOUBTEDLY THE BEST ALBUMENIZED PAPER.

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GIVE IT A TRIAL. FOR SALE BY ALL DEALERS.

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Photographic Materials of every description.

FIRST-CLASS GOODS

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REASONABLE PRICES.

All the new attractions in Photography and the daily changes in prices, render it impossible to issue a full descriptive list, but will answer every inquiry of any article with special quotation.

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SQUEEGEE ROLLER.

Superior to anything in the Market.

The Scovill Squeegee Roller is especially designed to be used in the place of the ordinary Squeegee in working film and paper negatives, bromide prints, for removing surplus water from albumen prints before mounting, etc.

It is neatly constructed with black walnut handle, brass trimmings and a heavily covered rubber roller.

It will be found a very handy tool alike to the professional and amateur photographer.

Price, $1.00 each.

The "Turn-Over" Camera

Is the most simple and complete Hand Camera made. Holds twelve 4x5 Dry Plates without Plate Holders, for time and instantaneous exposures.

Price, $25.00.

Send for Descriptive Circular and Photograph.

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Everything Used in Photography.

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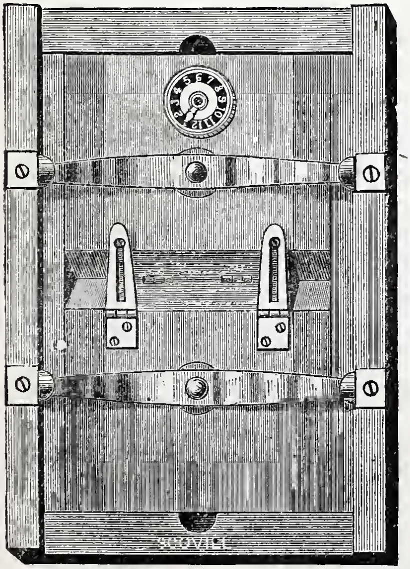
IRVING PRINTING FRAMES. WITH ADJUSTABLE SUPPORTS. (PATENTED.)



New Irving Printing Frame, Closed. Back View.

The **New** Irving Frames have valuable features which cannot be copied. They are in workmanship, design, and other respects, superior to all other printing frames.

The continuous felt pads insure absolute protection to the negative and uniform pressure throughout. The Irving Patent Catches lock the back, so that when one flap is open there is not the slightest danger of the flaps, paper or negative slipping.

The springs are cut by dies of specially tempered and tested metal, and are riveted to the backs with washers underneath to protect the wood-work.

The tally does not depend upon any other part of the frame to lock it, for the pointer will remain in place no matter what is done to other parts of the frame.

The Irving Frames are made of cherry guaranteed not to warp or crack. Their construction and finish is acknowledged to be superior to that of all other printing frames.

Prices for Half or Two-Thirds Opening Styles:

3¼x4¼..	$ .45	6½x 8½...	$ .70
4 x5	.48	8 x10.....	.80
4¼x5½....	.50	10 x12.....	1.10
4¼x6½....	.55	11 x14.....	2.10
5 x7	.60	13 x16.....	2.30
5 x8	.65	14 x17. . .	2.70

Beware of Inferior Imitations.

C. L. LITTLEWOOD & CO.,

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CAMERAS, LENSES, AND PHOTOGRAPHIC SUPPLIES

OF ALL KINDS.

CALL AND SEE OUR

"NEW DETECTIVE CAMERA."

No. 33 John Street,
(COR. NASSAU ST.)
NEW YORK CITY.

The Scovill Handy Flasher

Has been tried with safe "flash" mixtures like the Scovill Magnesium Compound, and invariably has given successful results. There is no device intended to accomplish the same purpose which is so convenient and portable. In fact it folds so compactly that it has been styled the "pocket flasher." A still more important consideration in its favor is that it may be so held as to throw the light downward, and thus avoid shadows. This is very important when flash photographs are made where there are light hangings and wall in the background. Some expert photographers attach a piece of cardboard to the handles of this flasher to serve as a reflector The Asbestos plates furnished and the use of fuse serve as additional safeguards to the operators.

Price, Handy Flasher, - - $1.00.

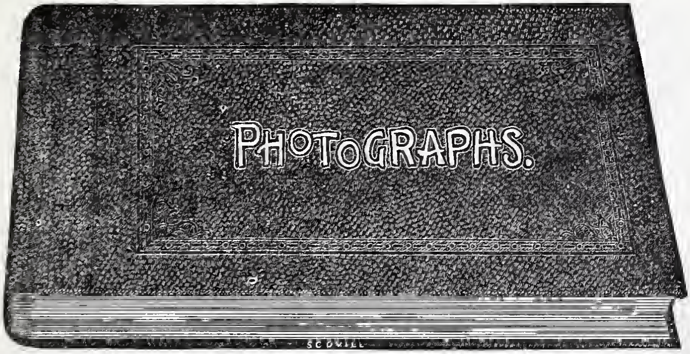
M&H
TRADE MARK

MILLER & COMPANY,
DEALERS IN
PHOTOGRAPHIC APPARATUS,
LENSES, CHEMICALS, ETC.
442 Fulton Street, - - BROOKLYN, N. Y.

Our New Portable Ruby Lamps, 60 cents by Mail.
Imperial Gray Paper, 5 x 8, 38 cents per doz., postpaid.
Peerless Blue Paper, 5 x 8, 27 cents per doz., postpaid.

SEND POSTAL FOR OUR NEW HANDBOOK OF PHOTOGRAPHY.

HOWARD ALBUMS
With Interchangeable Cards for Photographs.
(PATENTED AND LABEL REGISTERED.)



The Howard Album, with interchangeable cards, is the latest novelty in the way of an album for mounting photographs. In handsomely embossed covers are bound 25 of Collins' cards, which are chemically pure from all matter that would injure the photographs. In the mode of binding, and their interchangeable feature, lies the difference between this and other Albums.

Each card is mounted independently with a metallic bearing surface at the outer edge, protecting the holes through which the binding cord passes from tearing out.

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Photographers' Requisites.

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OUTFITS IN ALL SIZES A SPECIALTY.

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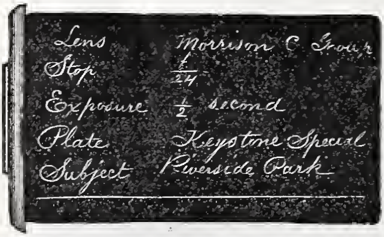

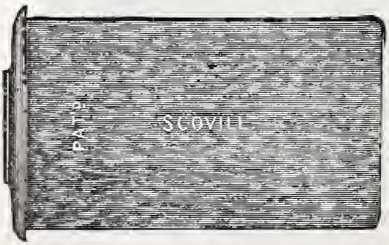

In the pleasure or excitement attendant upon picture-taking, holders and slides have been so changed about that the note-book afforded no clue to their identity. All photographers, whether professional or amateur, who have in time past puzzled their brains in the endeavor to solve such vexatious questions as these—

> "Have I or have I not exposed that plate?"
>
> "If exposed, was the plate used for that prized picture?"
>
> "Shall I incur the risk of making a double exposure?"

henceforth will have themselves only to find fault with if they do not procure and use in their dry-plate holders the patent registering slides, or as they have been called "Record Slides." These can be written upon with slate or lead pencil *ad libitum*, and the writing erased without injury to them.

Patent Registering Slides will be supplied with new American Optical Co. Dry Plate Cameras and Amateur Outfits up to 10x12 *size without addition to price list.*

JAMES LEE & CO.,

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IMPORTERS OF

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CURLEW BRAND

of Superior Quality for Photographic Purposes.

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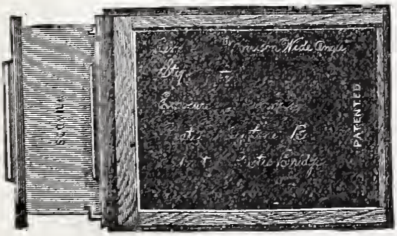
SCOVILL Light-Weight DOUBLE HOLDERS.

Substantial, serviceable and accurate double holders cannot be made smaller or lighter than the Scovill Light-weight Holders, and though so thin kits may be used in them. They yield a negative *the full width of the plate*, and, what is equally important, the plate may be placed in these holders or removed therefrom *without touching the sensitive surface* and *without danger of breaking it*. Observe the means shown in illustration for locking the slides. They are made with solid frame so that they *will not come apart, leak light, or warp*, and all have the *patent Registering Slides*.

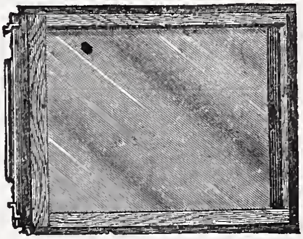
Price Light-weight Double Holder.

3¼x4¼	$1 10
4 x5	1 25
4¼x5½	1 25
4¼x6½	1 25
4¾x6½	1 30
5 x7	1 30
5½x7	1 40
5 x8	1 40
6½x8½	1 70
8 x10	2 00
10 x12	3 50
11 x14	5 00

Patented Nov. 15, 1887, *and Jan.* 24, 1888.



Showing Patent Registering Slide.



With Front Slide taken out.

A. Z. SIEBERT

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BY SOLAR AND ELECTRIC LIGHT.

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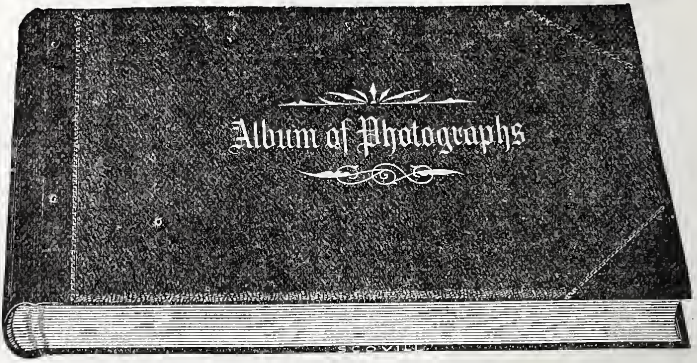
Having every facility for producing first class Enlargements by the **Platinum Process.** I respectfully solicit your orders, and will say, that having **Electric-Lights,** I am enabled at all times to fill the orders of customers without the vexatious delays consequent upon waiting for the sun. For customers who by their orders justify it, I can always ship a print in thirty-six hours after receiving the order. For permanence, beauty, and fine soft effect, showing pure whites and blacks, these prints are unrivaled. I have recently invented a method of preparing the Prints for Pastel work, which is conceded by the best artists to be vastly superior to the ordinary Pastel Paper. Send for Sample.



PRICE LIST OF

Scovill's Albums for Photographs.

Size of Card	6x7	7x10	10x12	11x14	14x17
For Photo. (size)	4x5	5x8	6½x8½	8x10	11x14
Plain	$1.25	$1.50	$2.25	$2.50	$5.00
With Prepared Surface	1.50	1.80	3.00	3.50	6.50
With Gilt Lines	1.75	2.00	2.75	3.00	

Each Album has 48 pages, 24 leaves. In them the finest card-board only is used, chemically free from anything that could injure a print.

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IMPORTER & MANUF'R of PHOTOGRAPHIC MATERIALS,

AND SOLE IMPORTER OF THE

Diamond Brand Extra Brilliant D Trade Mark **Albumen Paper,**

DRESDEN.
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IMPORTED PHOTOGRAPHIC CARD MOUNTS.

J. A. K. Lenses, Papier Mache Trays, Chemicals, Ruby Lamps.

Send for Price List for J. A. K Rapid Rectilinear Lenses.
Cheapest Lens in Market.
Also the best *TRAY* and *CHEAPEST PAPIER MACHE.*

51 FRANKLIN STREET, - - NEW YORK.

The ∴ Scovill ∴ Magnesium ∴ Compound

IS ENTIRELY FREE FROM POISONOUS INGREDIENTS.

In order to demonstrate this, quantities have been eaten at various times. It has often been pounded in a mortar to show that it does not explode.

The results obtained by using our Magnesium Compound have never been surpassed.

PRICE OF SCOVILL MAGNESIUM COMPOUND.

In ounce bottles, with fuses					$ 50
In quarter pound cans, with fuses					1 40
In half	"	"	"	"	2 65
In one	"	"	"	"	5 00
In five	"	"	"	"	20 00

PRICE OF SCOVILL MAGNESIUM CARTRIDGES.

			Per. Pkg.	Per Gro.
No, 1, Small Size, in packages of six			$0 25	$6 00
No. 2, Medium,	"	"	40	9 00
Large,	"	"	75	17 00

ALLEN, ROWELL & CO.,

PRACTICAL PHOTOGRAPHERS

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ALLEN & ROWELL

Dry Plates.
Ivory Films.
Bromide Paper.

Also Stripping Plates and all Carbon Materials.

POSITIVE IVORY FILMS IN TWO COLORS, WHITE AND PINK.
TRY THEM!

The enviable reputation enjoyed by this firm is the result of many years of faithful application to their chosen profession a thorough practical knowledge of which enables them the better to fulfill its requirements in the manufacture of MATERIALS USED. Although pioneers in the manufacture of Dry Plates, Stripping Plates, and Carbon materials for their own use, it is only after the more recent addition of Ivory Films and Bromide Paper, which forced them to increase their facilities, that they have resolved to place these goods on the market. The best recommendation is a personal test, which is respectfully but urgently solicited.

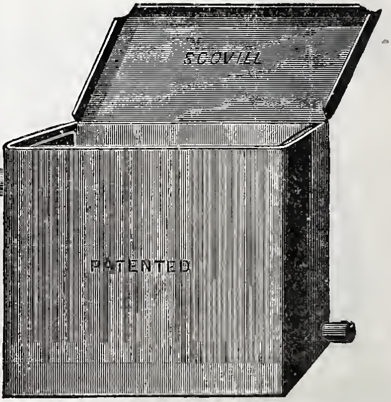
FOR PARTICULARS ADDRESS,

ALLEN, ROWELL & CO.,
No. 25 WINTER STREET, BOSTON, MASS.

FOR SALE BY THE SCOVILL & ADAMS COMPANY,
AND ALL STOCK DEALERS.

THE SCOVILL NEGATIVE WASHING BOXES.

(PATENTED.)



The Scovill Negative Washing Boxes are all now made adaptable and so that plates may be taken out without putting the fingers in the washing water. (See illustration.) The perforated bottom prevents water from passing through the box with too great force, and distributes it so that every plate and every portion of a plate is equally washed, and this cannot be done with any other washing box.

PRICE LIST.—(ADAPTABLE.)

	EACH.
For 3¼ x 4¼ Plates	$1 60
" 4 x 5 " and smaller sizes	1 75
" 4¼ x 5½ " " "	1 90
" 4¼ x 6½ " " "	2 00
" 5 x 7 " " "	2 10
" 5 x 8 " " "	2 15
" 6½ x 8½ " " "	2 25
" 8 x 10 " " "	2 50
" 10 x 12 " " "	4 00
" 11 x 14 " " "	5 00
" 14 x 17 " " "	6 00

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COMPLETE AND CAREFULLY
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HYDROCHINON * CAPSULES.

Light, Compact—Just the thing for Tourists.

PRICE, 60 CENTS PER SET.

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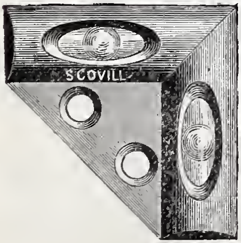
AN entirely new and practical idea by which a chemically pure DRY DEVELOPER, working admirably on any make of DRY PLATES, can be preserved *unchanged* for any length of time; transported *by mail* to any part of the country (occupying but a very small space), and used to make any quantity of Developer, without the use of measures or weights of any kind. *Directions for use inside each box.*

The * Scovill * Double * Level.



THE Scovill Double Level will be appreciated by Landscape and Tourist Photographers. It is quite compact and may be attached either to the body or platform of the Camera, and may be used also with cameras of different sizes.

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Allows transferring of Plates and Development in Daylight, with any Developer.

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S. P. C. BROMIDE PAPER DEVELOPER.	
For Eastman Bromide Paper	$ .75
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Does not stain the fingers or leave the plate yellow; works equally well with all brands of plates, giving perfect detail, density, and brilliancy in the negative. Full directions enclosed in each package. Price, per package	.60
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Price, per package	.50
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(For Strengthening Weak Negatives). Price, per bottle	.75
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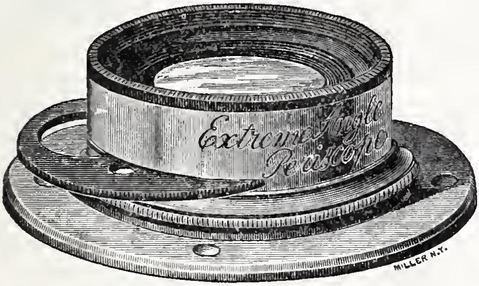
PERISCOPE LENSES

POSSESS QUALITIES FOUND IN NO OTHERS.

EXTREME ANGLE PERISCOPE.



Aperture F-10. Angle 115°.

No.	Equivalent Focus.	Largest Plate Covered.	PRICE:
1	2.9 in.	5 x 7	$24.00
2	3.6 "	6½ x 8½	27.00
3	4.2 "	8 x10	32.00
4	5. "	10 x12	40.00
5	5.9 "	11 x14	51.00
6	7.1 "	14 x17	66.00
7	8.4 "	16 x20	87.00
8	10. "	20 x24	116.00
9	12.6 "	25 x30	150.00

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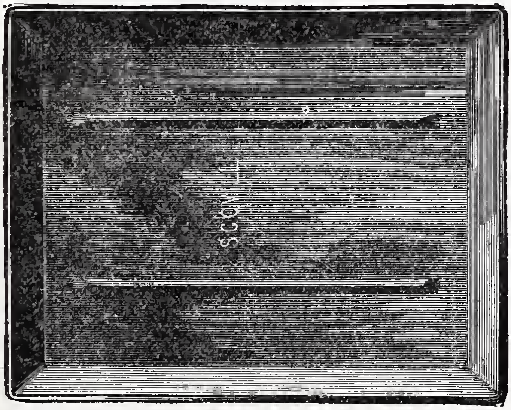
NEW YORK.

THE SCOVILL GLOSSY RUBBER TRAYS.



After a protracted and costly series of experiments, we are now able to offer to the trade, a superior article in texture, durability and polish. The utility of the parallel ridgelets must at once be apparent to the photographic practitioner.

PRICE LIST.

	Size.		Price, each.
No. 200,	4⅜ x 5⅝ for 1-4, 4-5, and 4¼ x 5½	plates	$0 28
" 300,	5½ x 8½ for 5 x 7 and 5 x 8	"	56
" 400,	7 x 9 for 6½ x 8½	"	72
" 500,	8½ x 10½ for 7 x 9 and 8 x 10	"	1 08

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"T. L. S." RAPID RECTILINEAR.

Perfectly Rectilinear, Very Rapid,

EXTRAORDINARY LOW IN PRICE.

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3¼ x 4¼	Frames, in boxes, per doz.	$0 24
4 x 5	" " "	33
4¼ x 5½	" " "	36
4¼ x 6½	" " "	38
5 x 7	" " "	54
5 x 8	" " "	57
6½ x 8½	" " "	84
8 x 10	" " "	1 44
10 x 12	" " "	2 16
11 x 14	" " "	2 88
14 x 17	" " "	4 08
16 x 20	" " "	5 04
17 x 20	" " "	5 28
18 x 22	" " "	6 48
20 x 24	" " "	8 40

The above goods are very desirable, and the demand for them is increasing. They are put up in boxes containing one dozen pads each.

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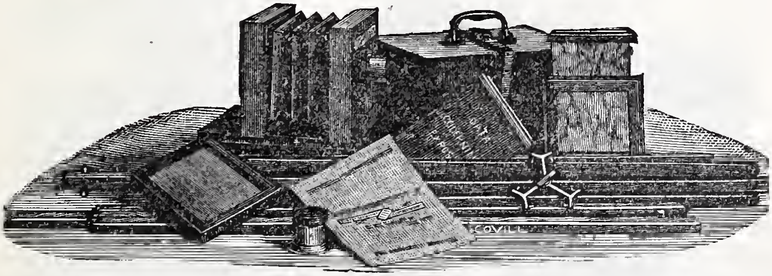
ALL ARTICLES OF WHICH ARE WARRANTED ACCURATE IN EVERY RESPECT.



These Outfits are lighter, more compact, far handsomer and more accurate than any which are offered at the same price. Many professional photographers have bought them and use them constantly. *In each outfit the Waterbury Lens is worth the price charged for the entire outfit.*

PRICE LIST.

4 x 5	Favorite Outfit	$10 00	5 x 8	Favorite Stereoscopic Outfit	$18 50
5 x 7	"	12 00	6½ x 8½	" Outfit	15 00
5 x 8	"	12 00	8 x 10	" "	25 00

Favorite Outfits consist of a Favorite View Camera with vertical shifting front, single swing movement, rubber bellows and folding platform, with patent latch for making bed rigid instantaneously; also, 1 Patent Double Dry Plate Holder (Reversible), with patent Registering Slides, and with Kits; 1 Taylor Improved Folding Tripod; 1 "Waterbury" Achromatic Lens, with a set of stops, and 1 Carrying Case.

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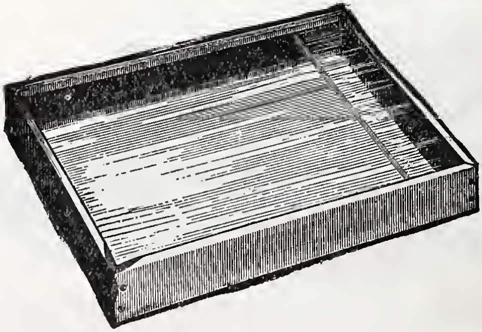
The Acme Glass Bottom Developing Trays

FOR DRY PLATES.



These Trays enable the operator to develop a plate without removing it from the solution until fully developed.

The Acme Trays are made of Walnut, with Glass Bottoms, and Receptacle at one end to hold the solution while looking at the plate. They also have buttons adhering to the glass to prevent suction.

The Acme Trays are superior to all others in respect to cheapness, durability and cleanliness. They are lined with acid proof cement, and warranted not to leak.

PRICES FOR TRAYS WITH RESERVOIR TO DEVELOP.

5 x 7	Plate and smaller..	$1 00	8 x 10	Plate...............	$1 30
5 x 8	"	1 20	10 x 12	"	2 00
6½ x 8½	"	1 25	11 x 14	"	2 25
			15 x 18	"	4 00

20 x 24 Trays for silvering whole sheets, without reservoir, but with double thick glass bottom....... .... 5 00

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Dark Room for the FREE use of our Patrons.

PRINTING, DEVELOPING AND ENLARGING
DONE ON SHORT NOTICE.

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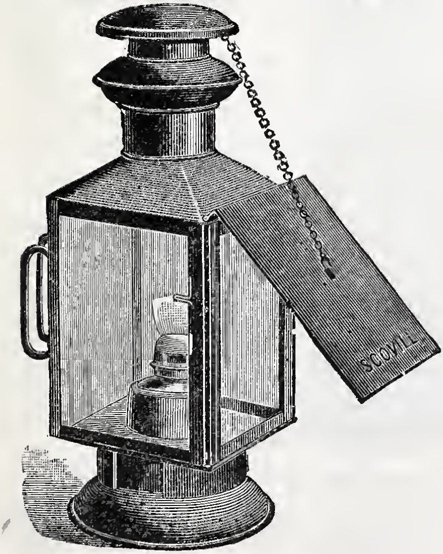
The Scovill Peerless Dark-Room Lantern.



"This is without question the best Lantern for the photographer's use yet introduced." Such is the report of experts who have had them in use for months.

Why they were agreed in their conclusions:

Because the ventilation is perfect, and danger of overheating overcome.

Because it is constructed so that white light does not escape.

Because it gives ample light for the dark-room.

Because the abundant light does not fog, but does show any spot or blemish in the plate.

Because so much of the light may be thrown into the developing dish and be shaded from the eyes.

Because it may be used either with coal oil or candle.

Because the flame may be so quickly controlled by unlatching the door or uncatching the bottom of the Lantern. **Price, $2.50.**

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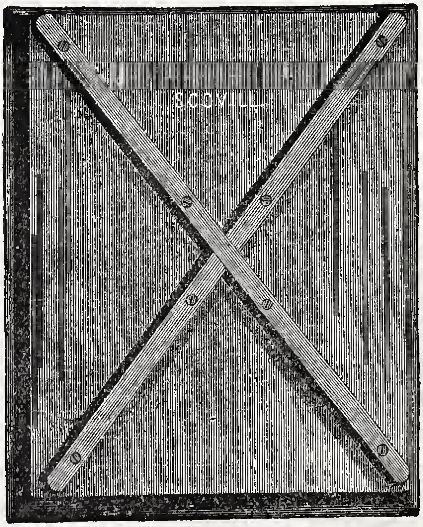
The WATERBURY TRAYS are the BEST and CHEAPEST.

The ∴ Waterbury ∴ Trays



Are Guaranteed not to warp or crack.

CANVAS is not required for the seams, as the bottoms are seamless and rest on cross-strips—a great improvement for steadiness over knobs at the corners, which were liable to be broken off.

PRICE LIST.

	Each.		Each.
15x19 Waterbury Trays........	$3 50	22x28 Waterbury Trays........	$6 50
19x24 " "	5 00	25x30 " "	9 00

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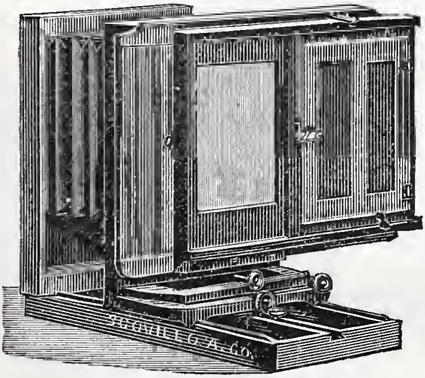
Telephone, 1356. **PITTSBURGH, PA.**

American Optical Co. Royal Cameras



WITH WATERBURY C. S. HOLDER.

No. 40.— 8 x 10 Royal Camera, double swing-back,	$50 00
" 41.—11 x 14 " " "	85 00
" 42.—14 x 17 " " "	110 00

Above the 8 x 10 size an extra ground-glass is supplied for use in focusing when pictures of groups are being taken.

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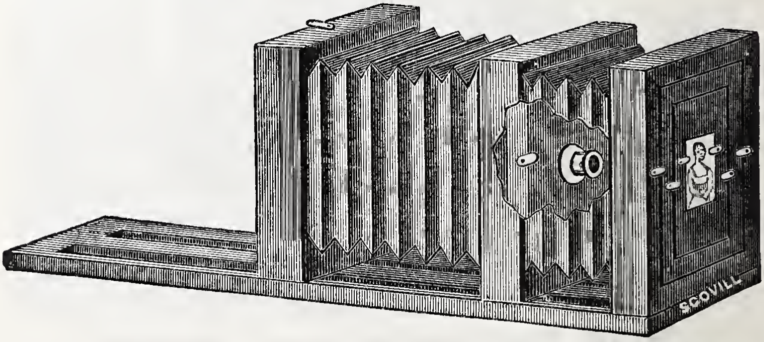
ENLARGING, REDUCING AND COPYING

CAMERAS



No.	61,	Size,	6½x 8½,	Price,	$30.00	No.	65,	Size,	14x17,	Price	$ 72.00
"	62,	"	8 x10	"	35.00	"	66,	"	17x20,	"	90.00
"	63,	"	10 x12	"	48.00	"	66½,	"	18x22,	"	100.00
"	64,	"	11 x14	"	60.00	"	67,	"	20x24,	"	110.00

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BACHRACH'S SPECIAL SATIN-GLOSS DRESDEN PAPER,

Manufactured to order. Non-Blistering and Rapid-Toning; the most Brilliant paper for Soft Negatives in the market.

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Electric Light! Promptness and Low Prices! Price List on application. Address,

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Bargains in Second-hand Lenses.

HENRY D. MARKS,

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PHOTOGRAPHIC MATERIALS

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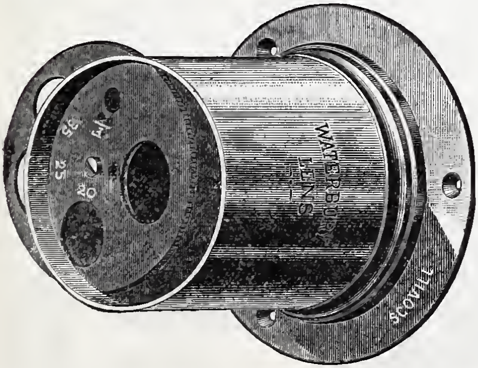

THE Waterbury Lenses are composed of a bi-convex crown glass lens cemented to another lens of the plano-convex form, made of the best selected flint-glass.

Owing to the great advances in the sensitiveness of emulsion plates, the Waterbury Lenses are now commonly used for groups and for instantaneous views, with the Scovill Safety Shutters described on another page.

A, Single, for 4x5 plate	$3 50
A, Matched pair, stereoscopic	7 00
B, Single, for 5x8 plate	4 50
B, Single, with patent shutter	5 50
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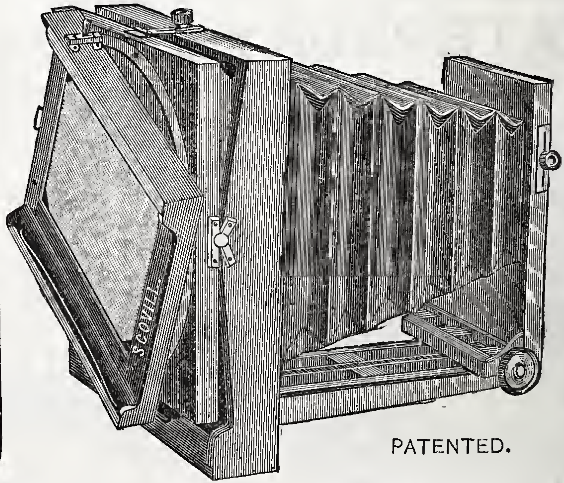
BEST GOODS AT LOWEST PRICES.

SCOVILL
REVOLVING BACK CAMERAS
FRONT FOCUS PATTERN.



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SEE REDUCED PRICE-LIST
IN NEW AMERICAN OPTICAL CO. CATALOGUE.

REVERSIBLE No.	For View	Sing. Sw.	Doubl. Sw.	With Reversible Back and Holder Extra
120	4 x 5 in.	$27.00	$32.00	......
121	4¼ x 5½	29.00	34.00	......
122	4¼ x 6½	31.00	36.00	......
123	5 x 7	33.00	38.00	......
124	5 x 8	35.00	40.00	......
125	6½ x 8½	40.00	45.00	......
126	8 x 10	45.00	50.00	......

With Detachable Back. REVERSIBLE No.	For View	Sing. Sw.	Doub. Sw.	With Reversible Back and Holder Extra
127	10x12	$60.00	65.00	
128	11x14	65.00	70.00	$ 90.00
129	14x17	75.00	80.00	105.00
130	17x20	85.00	90.00	115.00
131	18x22	95.00	100.00	130.00
132	20x24	115.00	120.00	150.00

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I have in stock apparatus made by the Scovill & Adams Co., Anthony & Co., and Rochester Optical Co. and Blair Camera Co.

Also, Cramer, Carbutt, Eastman, Harvard, Phœnix, Stanley and Seed Dry Plates in stock, and constantly on hand.

JUST THINK OF IT!

4 x 5 Rapid Rectilinear Lens for	$ 9 00
5 x 8 Rapid Rectilinear Lens for	10 80
8 x 10 Rapid Rectilinear Lens for	16 20

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BUCHANAN, BROMLEY & CO., Importers,

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The "Wonder" Equipment.

PRICE, $7.50.

CONSISTS OF THE FOLLOWING:

- 1 4x5 "Wonder" Camera,
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- 1 Ruby Lantern,
- 1 Rubber Focus Cloth,
- 1 Package Dry Plates,
- 1 Doz. Sheets 4x5 Extra Gloss Sensitized Paper.
- 1 Set S. P. C. Toning Solution,
- 1 4x5 Flat Printing Frame,
- 1 Jar Paste,
- 1 Paste Brush,
- 1 Package Round Corner Primrose Mounts,
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RAPID RECTILINEAR LENSES.

4 x 5	$10 00	6½ x 8½	$15 00
5 x 8	12 00	8 x 10	18 00

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Free Dark Room. BOSTON, MASS.

WATERBURY DETECTIVE CAMERAS.

The WATERBURY DETECTIVE CAMERAS present the following Claims for Superiority:

Timed and Instantaneous Photographs. This is the only Detective Camera which is as well adapted for making views as for photographing quickly moving objects. The negatives produced are of such sharpness that they may be enlarged to almost any size. It is in fact,

The only Detective Camera made with plate for tripod, and ground-glass the full size of the plate, just as in an ordinary view camera. This ground-glass is where it cannot easily be broken.

The Recessed Finder is fitted to the WATERBURY CAMERA, and it differs from finders ordinarily supplied in that it shows *exactly the same image* as is included on the ground-glass, though diminished in size. Without this accurate finder, one cannot be sure of what is taken in or left out of an instantaneous photograph.

The Least Trouble of any hand camera, because you can have the negatives developed and the finished pictures delivered directly after making the exposures by sending them to a photographic printer. Where there is no waiting and uncertainty, there will be no worry.

In addition to the foregoing special advantages, the small WATERBURY DETECTIVE CAMERA is certainly as light as any hand camera made which yields 4 x 5 negatives.

The Instantaneous Lens in this Camera is not of the "universal focus," distorting, nondescript character, but works with such rapidity, and is of such uniform excellence that it has added greatly to the popularity of this Camera.

The Focusing Scale is where it may be readily seen, but the focusing lever is placed in the recessed bottom where it will not attract attention and be in the way.

The whole appearance of the WATERBURY DETECTIVE CAMERA, especially of the leather covered pattern recently introduced, is exceedingly neat.

With this Camera there is greater certainty of securing good pictures than with any other of the class designated as "Detective" cameras. This will be admitted by every candid photographic merchant.

Price List.

4 x 5 Waterbury Detective Camera, with 2 Double Holders	$25.00
5 x 7 Waterbury Detective Camera, with 2 Double Holders	40.00
4 x 5 Waterbury Detective Camera, with Roll-Holder and Automatic Register	35.00
5 x 7 Waterbury Detective Camera, with Roll-Holder and Automatic Register	58.00

THE ∴ PLATINOTYPE

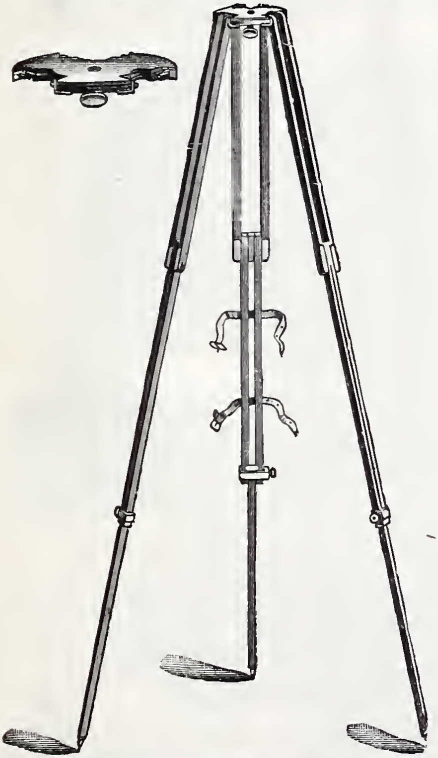
(PATENTED.)

THIS FAVORITE PROCESS has been in great demand during the past year.

We continue to prepare paper for the "**Black and White**" process, and recently we have introduced the "**Sepia**" process, obtaining results equal to best made in England. Send 10 cents for sample portrait or landscape, by either process, and Book of Instructions.

WILLIS & CLEMENTS, 39 SOUTH 10th ST., Philadelphia, Pa., U. S. A.

The Albion Tripod.



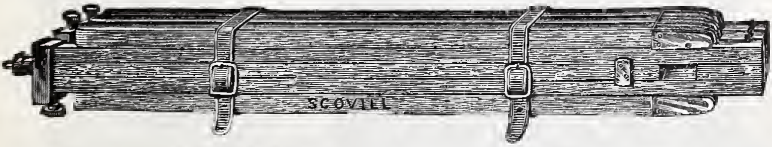
This is the most elegant Tripod ever introduced. It is adapted to and is firm enough to support without vibration any View Camera from 5 x 7 to 10 x 12 size, inclusive.

The Legs of this Tripod are adjustable as to length, and may be quickly folded. As the binding straps are attached, they are always in place when wanted.

The artistic design and faultless finish of every portion of this Tripod cannot be realized without seeing one, and to use an ALBION TRIPOD means to be fully satisfied, and wish for none other.

—PRICE.—

No. 1................	$6.00
No. 2, Smaller,........	5.00
No. 3, Spruce (very light)	5.00



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SALESROOM, 550 BROADWAY,
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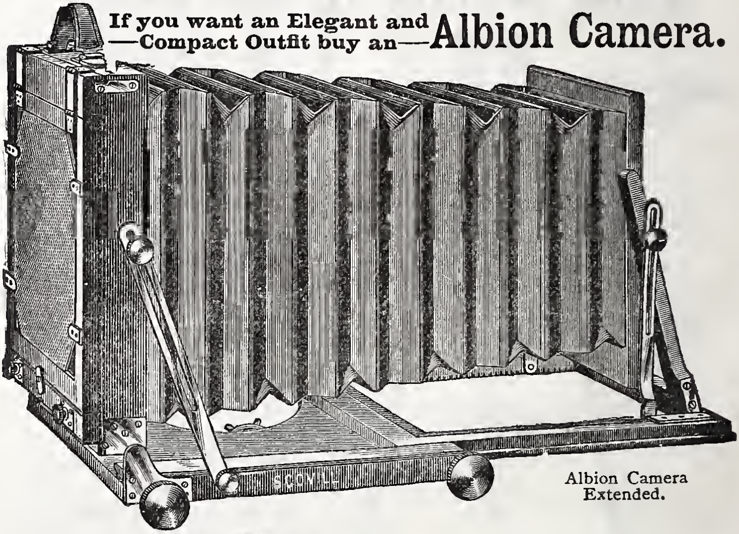
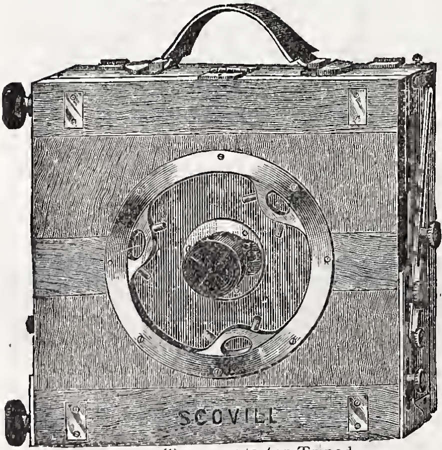
If you want an Elegant and —Compact Outfit buy an—

Albion Camera.



Albion Camera
Extended.



Showing Turn-Table for Tripod.

PRICE LIST
OF

Albion Cameras.

Each with Albion Tripod and Extra Fine Canvas Carrying Case.

No.	Size.		With 1887 Model Roll Holder.
550.	4¾x 6½,	$47 00	$61 50
551.	5 x 7,	48 00	62 50
552.	5 x 8,	49 00	63 50
553.	6½x 8½,	50 00	68 00
552.	8 x10,	60 00	82 00

MANUFACTURED BY
THE SCOVILL & ADAMS COMPANY,

Send for Descriptive Circular.

“THE MIDGET” DETECTIVE CAMERA.

THE SMALLEST, LIGHTEST, AND MOST COMPACT
4X5 DETECTIVE CAMERA EVER MADE.

Fitted with an entirely new Focusing Attachment, Wray Rapid Rectilinear Lens, Aperture F/5.6. and Prosch Triplex Shutter.

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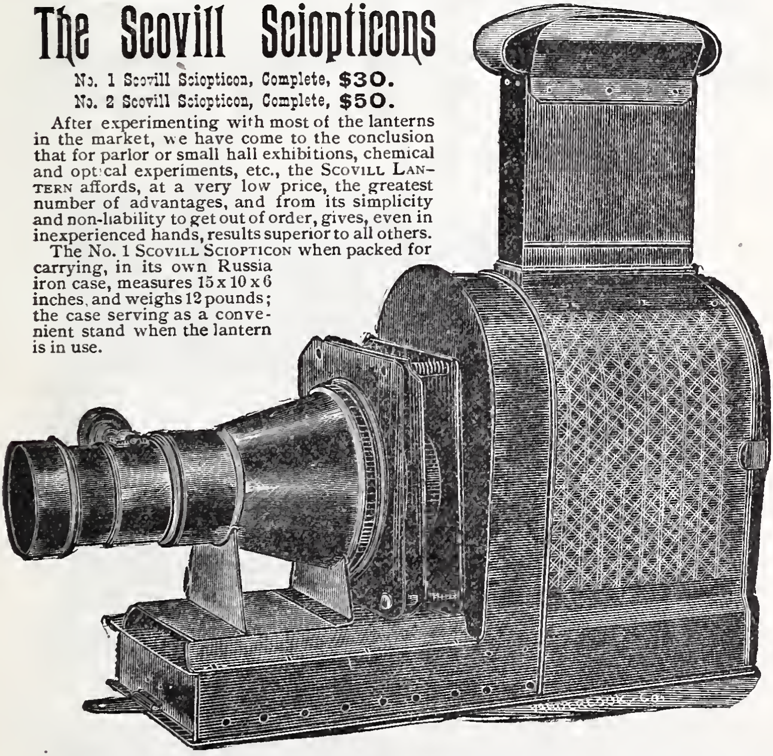
The Scovill Sciopticons

No. 1 Scovill Sciopticon, Complete, **$30.**
No. 2 Scovill Sciopticon, Complete, **$50.**

After experimenting with most of the lanterns in the market, we have come to the conclusion that for parlor or small hall exhibitions, chemical and optical experiments, etc., the SCOVILL LANTERN affords, at a very low price, the greatest number of advantages, and from its simplicity and non-liability to get out of order, gives, even in inexperienced hands, results superior to all others.

The No. 1 SCOVILL SCIOPTICON when packed for carrying, in its own Russia iron case, measures 15 x 10 x 6 inches, and weighs 12 pounds; the case serving as a convenient stand when the lantern is in use.



The CASE and BODY of the Lantern are of Russia iron, and neat and compact in form. That part of the body which surrounds the lamp is double, the outer covering being ornamentally perforated so as to allow a constant current of air to circulate and keep down the temperature.

The lamp is of the triple wick variety, and so constructed that the three flames combine, and by the draught of a ten-inch chimney give a brilliant flame.

The CONDENSER is four inches in diameter, neatly mounted in brass, thoroughly ventilated, and arranged with screw flange so that the lenses may be separated and cleaned when required.

The CONE, which carries the objective, and the mount of that lens are nickel-plated. The objective is a double achromatic lens of one and a half inch clear aperture and five-inch focus, so that at a distance of twelve feet from the screen, it gives a brilliant picture on disc six feet in diameter. The focus is roughly obtained by sliding the front, carrying both cone and lens; and fine adjustment by a rack and pinion on the objective.

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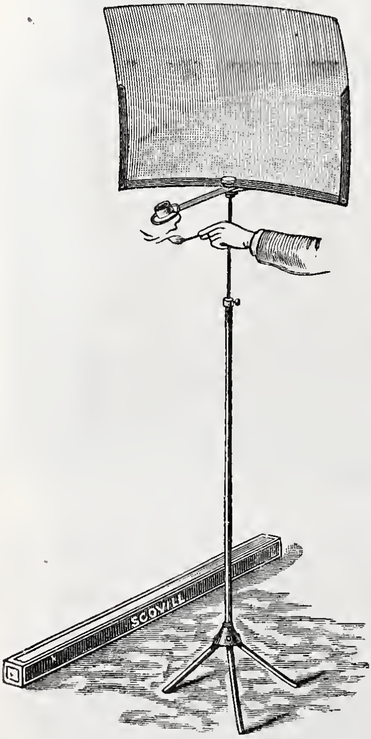

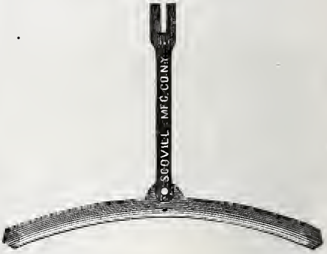
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AN important improvement has recently been made which adds very materially to its effectiveness in taking large groups or interiors. If the picture to be taken is so large that more than one of the magnesium cartridges is necessary, it has been found best to spread the magnesium in a train instead of confining it in the box. This method has the advantage of giving an even diffusion of light over a considerably greater area as well as the instantaneous and complete combustion of a large quantity of powder. This very lightly curved trough, hinged on the connecting arm can be readily adjusted to any angle, so that the illumination is completely within the operator's control. The powder can be spread over a space of twelve inches.

The Scovill Reflecting Screen serves as a shield for the operator protecting him from the blinding flash and great strain to the eyes, resulting from the ignition of magnesium compounds where no screen is used. The reflector concentrates the light where desired. It is adjustable in height, from 3 to 7 feet, and is a most convenient side screen for making portraits in the studio or in the house.

It forms a perfect music stand, and when not in use is folded in the box shown in the illustration.

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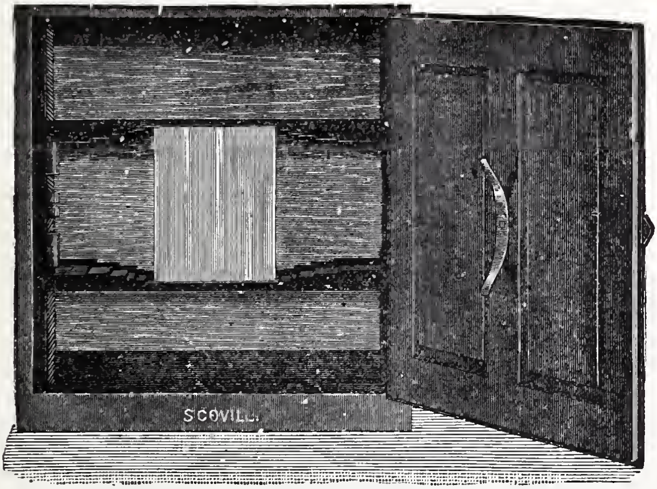

THE WATERBURY HOLDER may be adjusted to various sizes of plates quicker and easier than any other holder. No kits are required, and the plates used must be in the center, and may be laid in the proper place in the dark.

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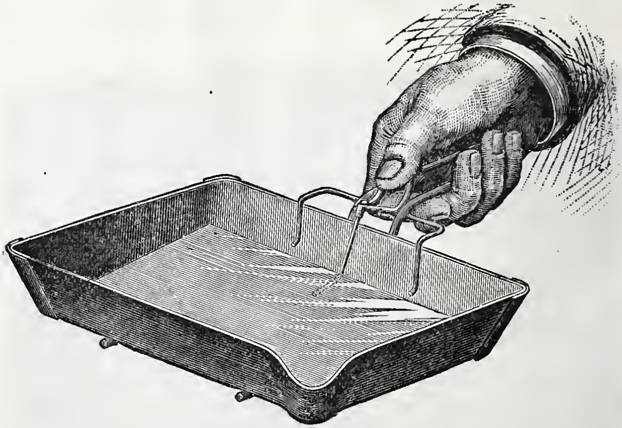

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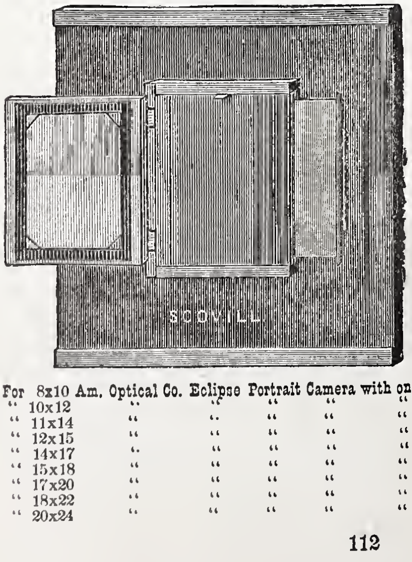

Consists of a board the same size of the plate-holder of the camera. It is put in place the same as holders. upon pegs, with spring catch at top In center of board is an opening with hinged ground-glass to receive the holder selected, 4¼x6¼, 5x7, or 5x8. Can be fitted to any 8x10 or larger portrait camera by sending exact size of plate-holder. When wishing to use larger plates can be instantly removed. By the aid of this attachment and twelve single light-weight holders you always have a supply of plate-holders loaded and ready for use, save the expense of large extra holders and many a trip to the dark-room, and you are sure of always getting your subject in the proper position on the plate.

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"	17x20	"	"	"	"	"	"	"	"	13 00
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